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environmental impact statement

for

Lakeview, Arkansas

Wastewater Treatment Facilities

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DRAFT
ENVIRONMENTAL IMPACT STATEMENT

FOR

LAKEVIEW, ARKANSAS
WASTEWATER TREATMENT FACILITIES

GRANT NO. C-05-0441-01-0

U.S. ENVIRONMENTAL PROTECTION AGENCY
REGION 6
DALLAS, TEXAS
JULY 1978

APPROVED BY:

ADLENE HARRISON
REGIONAL ADMINISTRATOR

A

EXECUTIVE SUMMARY

A. PROBLEMS AND ISSUES

The proposed project was initiated to provide wastewater collection and treatment for the Lakeview, Arkansas area which currently relies on individual septic tank systems. The main concerns and issues discussed in the EIS are:

- the extent of existing and potential ground- and surface-water contamination and related health hazards from septic tank systems;
- cost-effective alternatives to the proposed action including "no action" and upgraded on-site disposal systems;
- the disruptive effects of project construction on the community;
- cost and economic effects;
- the effects of discharge on water quality and aquatic life;
- aesthetic effects on fishing and tourism;
- the secondary effects of induced development and increased population density; and
- effects on archeological resources.

B. ENVIRONMENTAL SETTING

Lakeview is a small and relatively new community on Bull Shoals Lake in north central Arkansas. Lakeview is near Bull Shoals Dam in an area of the Ozark Mountains with flat-topped hills and steep-sided valleys along the White River. Lakeview is a recreation and retirement area with a population which is principally interested in the benefits of its lakeside location.

The 1977 population equivalent of the proposed project area is about 1,350, which includes incorporated Lakeview and certain residential and recreation areas outside the town limits. Lakeview and the surrounding region have grown rapidly in population because of scenic beauty, recreational opportunities, a quiet atmosphere, mild climate, attractive residential developments, and low taxes.

The White River in the Lakeview area is almost completely controlled by the operation of Bull Shoals Dam, and there are large flow fluctuations depending especially upon power generation. The Bull Shoals Lake and White River water quality is generally excellent. Cold water releases from the Dam have eliminated most of the native fish in a 100-mile stretch of the White River; however, an intensive trout-stocking program has created the largest and most productive put-and-take trout stream in the Nation. Bull Shoals Lake is heavily used for recreation including water-contact recreation. Incidents of septic tank effluent surfacing and runoff to the lake have occurred, but obvious local pollution effects or discernible water quality changes have not been noted at lake and river monitoring stations.

Ground water generally lies at about 110-ft depth in the Lakeview plateau area and this shallow fractured-limestone aquifer is used for many small public and private well supplies. Underlying formations with much greater yields are used for larger public wells. Much of the Lakeview area is served by a water association which obtains its water from another lake source via the City of Mountain Home, 15 miles away.

Wells sampled in the Lakeview area indicate elevated levels of nitrate and chloride in the shallow aquifer near the tourist and commercial center. Contamination from on-site disposal systems is strongly indicated since there are no major agricultural or other pollution sources in the vicinity. The bacteriological results were unsatisfactory (high coliform bacteria counts) for most of the well systems sampled, although the cause cannot necessarily be attributed to aquifer contamination by septic tank systems.

The important factors influencing the performance of on-site disposal systems include soils, topography, geology, ground water, and density of development. The topography is characterized by carbonate rock, sinkholes, subterranean drainage, solution channels, and caves. Leachate from septic tank systems percolates through this subterranean drainage system and may eventually reach the aquifer. The depth to rock is highly irregular in the Lakeview area because of the susceptibility of carbonate rock to solution and weathering. More than the 6-ft minimum required for septic tank systems is generally expected on the flat ridge area, with the steep slopes having less cover. Nearly all of the Lakeview area soil types are rated as having severe limitations for septic tank system installation because of slow percolation, swelling characteristics, shallow bedrock, rock content, and slope.

A survey was made to determine the extent of the septic-tank-system problems. Survey results indicated that moderate residential and serious commercial problems have been experienced in the Lakeview area. Most lots in the Lakeview area are 1/2-acre or less in size. Numerous septic tank systems, marginal soil conditions, rapid growth and development on rather small lots, and an aquifer formation vulnerable to pollution combine to produce a situation that is of public health and water-quality concern.

C. ALTERNATIVES EVALUATED

Several alternatives were evaluated including no-action, upgrading on-site disposal systems, constructing a municipal collection and treatment system, and participating in a regional system.

The no-action alternative will result in continued installation of individual septic tank systems to accommodate growth. Septic tank use can neither be appreciably altered nor limited under existing controls. Increasing pollution problems can be expected which will eventually affect the public health and lessen the attractiveness of the area. These conditions will mandate remedial measures for wastewater management, restricted growth, curtailed water uses, or other action. The no-action alternative will have the benefit of eliminating or deferring project related environmental impacts as well as any major public investment in wastewater facilities in the area, but will fail to address the basic objectives of pollution control and public health protection.

Properly operated and upgraded on-site disposal systems will lessen the occurrence of absorption-field failure and associated health and pollution problems; however, increased local ground water contamination from nitrate and chloride will continue in general proportion to growth. Aeration units or intermittent sand filters are the most effective means of upgrading septic tank systems, but are expensive. Cluster systems are an alternative for isolated developments in problem areas, but providing such systems for a static community is more economical and manageable than for a community as Lakeview with its rapid growth and seasonal tourist population. The capital, operating, and land costs for upgraded on-site systems in the Lakeview area will be high and long-term reliance on such systems will have serious economic and environmental drawbacks, and will pose many management difficulties as well.

There is no existing or planned regional wastewater system in the area, and the low population density of much of the region and rugged and rocky terrain make a regional system economically infeasible for the foreseeable future.

A wastewater collection-and-treatment system for the town of Bull Shoals (three miles across the dam from Lakeview) is nearing the construction stage. Connecting these two systems, while cost-effective, appears to be politically infeasible.

Water reuse is not a viable alternative in the Lakeview area because of the abundant high-quality water resources available and the lack of potential users. Land application is a possible alternative to treatment and discharge; however, potentially suitable sites are very limited and a cost advantage is unlikely.

The treatment and discharge alternatives are a contact-stabilization activated-sludge plant followed by disinfection and sand filtration; a trickling-filter plant followed by disinfection and sand filtration; and an aerated lagoon followed by sedimentation, disinfection, and sand filtration. The aerated lagoon system was selected as the most practicable because of its proven ability to meet effluent standards, simplicity, ease of operation, and low capital and operating costs. Chemical precipitation and dechlorination or other means of disinfection will be required by the Arkansas Department of Pollution Control and Ecology. The proposed system is expected to meet White River effluent requirements. Sludge removal and burial will be required at 10- to 20-year intervals.

An alternative treatment plant site with discharge to Bull Shoals Lake was rejected because of its need for added nutrient-removal treatment, its proximity to heavily used recreation and residential areas, and costly pumping requirements for serving areas below the dam.

D. PROPOSED PROJECT AND IMPACTS

The proposed treatment plant is designed to serve 3,000 persons at 100 gallons per capita per day (gpcd) for an average wastewater flow of 300,000 gal per day (gpd) in the 1995 design year. The present (1977) wastewater flow is estimated at 135,000 gpd, based upon a population equivalent of 1,350 persons at 100 gpcd. The collection system will serve the Town of Lakeview, Edgewood Bay, Leisure Hills, Bull Shoals State Park, the Lakeview Recreation Area, and the Gaston Road area. It will consist of about 90,000 linear feet (lin ft) of 8- and 10-inch gravity collectors, four pump stations and 11,300 lin ft of force-main, and a main line to the treatment plant consisting of 16,500 lin ft of 12-inch gravity sewer.

The treatment plant will require about 8 acres of land. Unit processes of flow measurement, bar screening, aerated lagoons, secondary settling, disinfection, and rapid sand filtration will achieve a high degree of treatment. The total cost of the proposed system is estimated at $2,041,000. The average monthly cost per household unit, including the cost of the private sewer line hook-up and filling existing septic tanks with gravel, will be about $10.45 initially and decrease to about $5.85 as customers are added over the design period. The cost of the project will not be an unreasonable economic burden for the residents.

Constructing the proposed project will take about one year. If the project proceeds in a localized step-by-step manner, and reasonable precautions and mitigative measures are taken, the short-term adverse effects on water and air quality and the biologic environment will be minor. There will be localized short-term noise, community disruption, and inconvenience even with mitigative measures. Lakeview and the region will benefit economically by construction employment opportunities and secondary economic stimulation.

The primary long-term water-quality benefits will be protecting and improving gound water quality and assuring that future degradation of surface waters, as well as ground water, from nonpoint septic tanks sources will be largely controlled in the Lakeview area. Health hazards from contaminated well water supplies will be reduced, and unsanitary effluent-surfacing from malfunctioning on-site disposal systems will be eliminated. The main biological concerns are the possible long-term effects of the effluent discharge on the important White River trout fishery. With dechlorination, the Lakeview discharge will have a minimal effect on trout and other aquatic species. The adverse visual effects of the treatment plant can be minimized by landscaping.

Two archeologically important sites were identified in the vicinity of the proposed plant. Adverse archeological effects will be avoided by shifting the treatment plant site a short distance to the west. The contractor will be alerted to watch for evidence of prehistoric occupation during construction in the valley.

The secondary effects of the project on growth and development will not be great within the project design period, but the ultimate rate of development and density will be altered because of increased value and the accelerated development of unplatted areas, and avoidance of future sanitary and environmental growth-constraints from septic tank systems. With or without the project, Lakeview will experience rapid growth because of its basic attractions and available development sites.

E. COMMENTS REQUESTED

The Draft EIS has been made available to the following Federal, state, and local interests for review and comment.

Advisory Council on Historic Preservation
US Department of Agriculture
US Department of Commerce
US Department of Housing and Urban Development
US Department of Health, Education and Welfare
US Department of Interior
US Department of Transportation
US Army Corps of Engineers
International Boundary and Water Commission
Federal Energy Administration
Federal Power Commission
Energy Research and Development Administration
Economic Development Agency
Environmental Protection Agency
State of Arkansas
Cities and Counties in Project Area
Environmental and Conservation Associations
Organizations and Civic Groups
Businesses and Individuals
News Media

F. **PUBLIC HEARING:** At 7:30 pm CDT on Monday, August 21, 1978, in the Community Building, Lakeview, Arkansas.

TABLE OF CONTENTS

Section — Page

EXECUTIVE SUMMARY i

A. Problems and Issues i
B. Environmental Setting i
C. Alternatives Evaluated iv
D. Proposed Project and Impacts vi
E. Comments Requested viii
F. Draft EIS to EPA viii

1. INTRODUCTION 1

1.1 Background 1
1.2 Issues 2
1.3 Federal Policy 3

2. PROBLEMS 5

2.1 On-Site Systems 5
2.2 Water Quality and Public Health 7
2.3 Growth and Associated Wastewater Problems 10

3. ALTERNATIVES 12

3.1 No Action 12
3.2 Upgrading On-Site Systems 14
3.3 Regional Wastewater System or Connection to Bull Shoals Plant 23
3.4 Municipal Wastewater System Design Alternatives 25
3.5 Alternatives Available to EPA 30

4. DESCRIPTION OF THE PROPOSED PROJECT 32

4.1 Treatment System 32
4.2 Collection System 33
4.3 Land and Operation and Maintenance Requirements 33
4.4 Construction Schedule 34
4.5 Costs 34

Section Page

5. ENVIRONMENTAL IMPACTS OF THE PROPOSED PROJECT 36

5.1 Geology, Soils, and Topography 36
5.1.1 Effects of Construction on Geology, Soils, and Topography 36
5.1.2 Effects of Operation on Geology, Soils, and Topography 36
5.2 Hydrology 37
5.2.1 Surface Water Setting 37
5.2.2 Ground Water Setting 39
5.2.3 Effects of Construction on Hydrologic Elements 40
5.2.4 Effects of Operation on Hydrologic Elements 41
5.2.5 Reliability Factors 42
5.3 Biology 44
5.3.1 Terrestrial Setting 44
5.3.2 Aquatic Setting 45
5.3.3 Effects of Construction on Fish and Wildlife 47
5.3.4 Effects of Construction on Vegetation 48
5.3.5 Effects of Operation on Fish and Wildlife 49
5.4 Socio-Economics 52
5.4.1 Socio-Economic Setting 52
5.4.2 Effects of Construction on Socio-Economic Elements 55
5.4.3 Effects of Operation on Socio-Economic Elements 57
5.5 Air and Sound Quality 63
5.5.1 Effects of Construction on Air and Sound Quality 63
5.5.2 Effects of Operation on Air and Sound Quality 64
5.6 Archeology and History 65
5.6.1 Effects of Construction on Archeology and History 65
5.6.2 Effects of Operation on Archeology and History 66

6. COORDINATION 67

6.1 Coordination and Public Participation 67
6.2 Correspondence 67
6.3 Review Process and Preparation of Final EIS 68

Literature Cited and Other References Consulted

Appendix A - Correspondence

Exhibits

	Exhibits	Follows Page
1.	Lakeview, Arkansas Location Map	5
2.	Soils Map	6
3.	Permeability and Subsurface Feaures	6
4.	Topography	6
5.	Septic Systems Survey	7
6.	Septic Systems Survey Summary	7
7.	Ground Water Quality	8
8.	On-Site Systems Performance	15
9.	On-Site Systems Costs	16
10.	Preliminary Cost Estimate for Connecting the Lakeview and Bull Shoals Sewer Systems	24
10A.	Alternatives Comparison	31
11.	Schematic of Treatment Facility	32
12.	Preliminary Layout of Proposed System	33
13.	Financing and Cost of Proposed System	34
14.	Water Quality - White River Below Bull Shoals Dam	38
15.	Water Quality - Bull Shoals Lake and White River	38
16.	Vegetative Communities	44
17.	Lakeview, Arkansas Population Data	53
18.	Population Trends of Surrounding Towns	54
19.	Land Use in Lakeview Area	55
20.	Zoning and Detailed Land Use	55
21.	Recreational Visitors at Lakeview Area Facilities	61

1. INTRODUCTION

1.1 BACKGROUND

The Federal Water Pollution Control Act, as amended (FWPCA), was enacted to restore and maintain the integrity of the Nation's waters. Because municipal sewage is a major source of water pollution, Section 201 of the law provided Federal grant assistance (up to 75% of project costs) to municipalities for the construction of wastewater treatment facilities.

The Environmental Protection Agency (EPA) awards Construction Grants in a three-step process: 1) initial planning, 2) detailed design, and 3) actual construction. In addition to providing grant funds, EPA (or the delegated State agency) issues permits for all pollutant discharges into the nation's water. These National Pollutant Discharge Elimination System (NPDES) permits require compliance with all applicable effluent limitations.

The National Environmental Policy Act of 1969 (NEPA) requires Federal agencies to prepare detailed environmental impact statements (EIS) on major Federal actions significantly affecting the quality of the human environment. Section 511(c)(1) of FWPCA requires that NEPA apply to the awarding of grants for public wastewater treatment systems under Section 201 of the same act. EPA has determined that the funding of the proposed wastewater treatment facilities for Lakeview constitutes a Federal action requiring the preparation of an EIS. The Notice of Intent to prepare an EIS was issued on June 30, 1977.

1.2 ISSUES

The major issues concerned with wastewater management planning in Lakeview are as follows:

a. The severity of septic tank system problems and the conditions for on-site disposal in the Lakeview area need to be further defined.

b. Possible public health hazards and water quality degradation from septic tank systems in the Lakeview area need further evaluation.

c. The alternatives for upgrading on-site disposal systems may be more cost-effective than constructing the proposed collection and treatment system.

d. The cost of the proposed collection and treatment system may be too great for the local residents. The estimated monthly sewer charge has not been presented, and some consider construction cost estimates optimistically low. The large number of persons with limited fixed incomes is cited in support of this view.

e. The issue of the sewage system's effect on the amount and density of development and the desirability of such growth is of great concern. Lower-density development in accordance with proper septic tank disposal-requirements may be preferable.

f. The current water-use estimates need further evaluation. Also, whether several jurisdictions outside the Lakeview incorporated area will participate in the project as planned is unconfirmed. These jurisdictions include the Corps of Engineers Lakeview Recreation Area, Bull Shoals State Park, and the Edgewood Bay and Leisure Hills developments.

g. Project effects, including damage to foliage, streets, driveways, and yards; the noise and disruption from extensive blasting; effects on archeological resources; damage to the fishing and tourism industry on the White River because of the discharge and visual effects of the proposed sewage treatment plant; and possible surface and ground water pollution from sewer leakage, particularly where the lines will be laid in excavated rock very close to Bull Shoals Lake, are of concern.

The project's direct environmental effects are important, but the fundamental issues concern the project's economic and environmental justification as compared with continued use of on-site disposal systems, and the secondary effects relating to growth and development.

1.3 FEDERAL POLICY

The current EPA policy on construction grant facility plan requirements for new sewage collection systems is discussed below. (EPA, 1977c.)

a. Grant Eligibility

Communities existing on October 18, 1972, may be eligible for new sewage collection systems under FWPCA. A community includes any area with substantial human habitation and, for grant eligibility, the bulk (generally, two-thirds) of the sewer system flow design-capacity should be for wastewaters originating from the October 18, 1972, population. Treatment works funded under the grants program must also represent the most cost-effective alternative.

A population density of 1.7 persons per acre (one household for every two acres) meets the requirement for substantial human habitation, and density is evaluated block-by-block or by areas of five acres or less. Densities of less than one household for every two acres rarely result in serious localized pollution or public health problems from using properly operated on-site systems and are not considered substantial habitation warranting collection sewers.

b. Cost-Effectiveness

New collector sewers should be funded only when existing on-site disposal systems are creating a public health problem, contaminating ground water, or violating point-source discharge requirements. Specific documentation of these problems and malfunctioning disposal systems, as well as discussions of limiting site-characteristics such as geology, soil permeability, topography, and ground water levels are required.

The alternatives to be evaluated for cost-effectiveness include but are not limited to measures to improve operation and maintenance of existing septic tanks, new septic tanks, holding tanks and "honey wagons," upgrading septic tanks with mound systems and alternate leaching fields, cluster systems, water conservation, and limited-area sewer service.

c. Disclosure of Costs and Implementation

Public notice must be given of the estimated costs for collection system projects, including monthly charges for operation, maintenance, and debt service. The overall policy applies to new grant applications for projects including collection systems, and the cost-effectiveness requirements apply to projects such as Lakeview for which the Step 1 Plan is yet to be approved.

2. PROBLEMS

The proposed project was initiated to provide wastewater collection and treatment for the Lakeview area in north central Arkansas, (see Exhibit 1) which currently relies on individual septic tank systems. There are about 375 septic tank systems in the project area based on the number of housing units and commercial establishments. Important factors influencing the performance of the on-site disposal systems include soil characteristics, topography, geology, ground water, and density of development. The principal public health concerns from septic tank disposal systems relate to unsanitary conditions from effluent surfacing, back-up problems, and contamination of surface and ground water, particularly, drinking water supplies and contact-recreation waters.

Regulations under the 1977 Arkansas Sewage Disposal Systems Act have superseded the Department of Health Bulletin #9 "Septic Tank Systems." The public policy and purposes of the Act include eliminating and preventing health hazards by regulating individual sewage disposal systems and to encourage the use of community sewerage systems when economically feasible wherever density of development or the lack of acceptable soils make individual sewage systems impractical.

2.1 ON-SITE SYSTEMS

Adequate soils are required for satisfactory septic tank systems. Field percolation test results are generally in the 12- to 20-minute range, which is within the 45-minute limit required by the Department of Health for septic tank systems. Field tests, however, are not directly comparable to the controlled Soil Conservation Service tests which are run

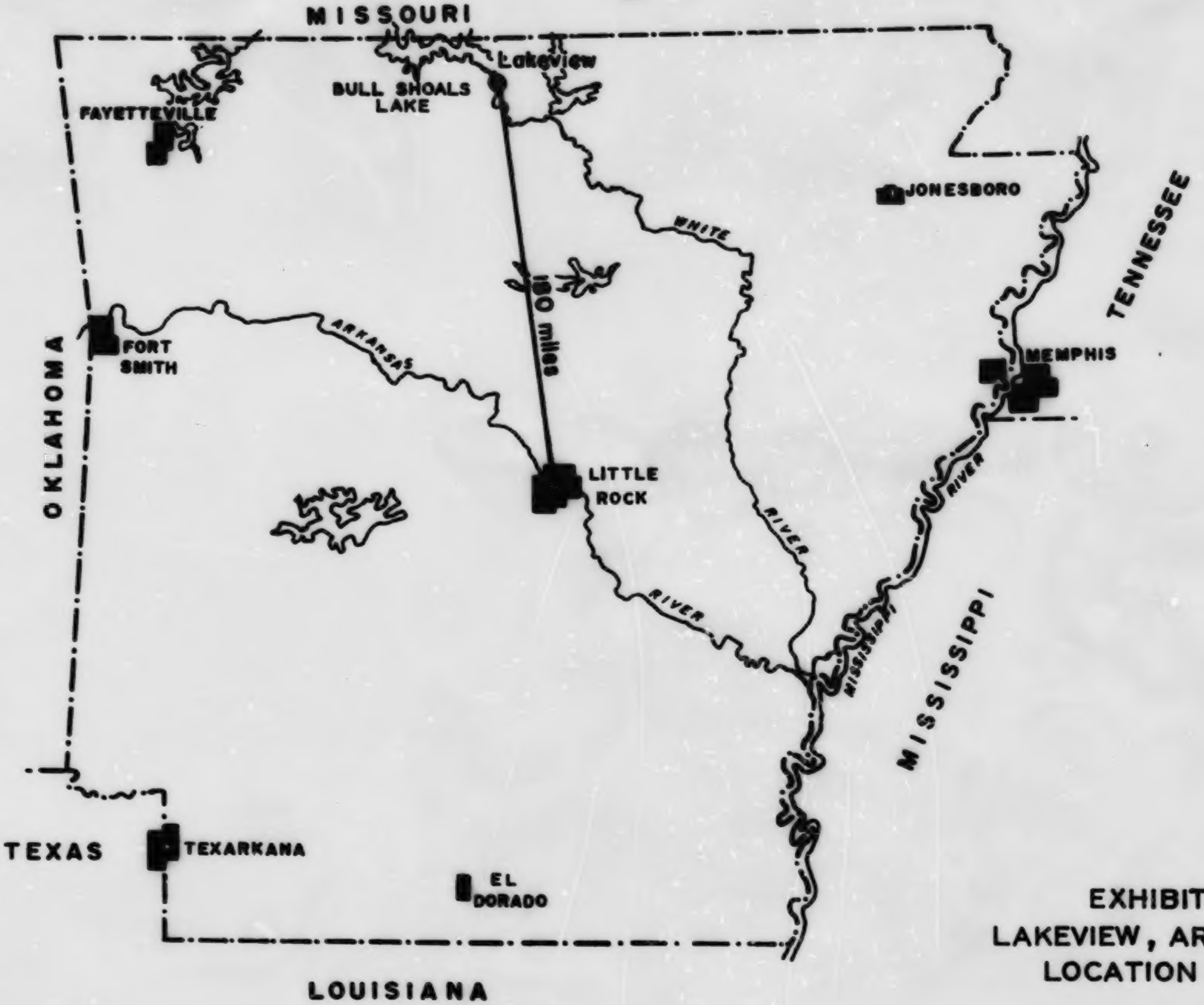
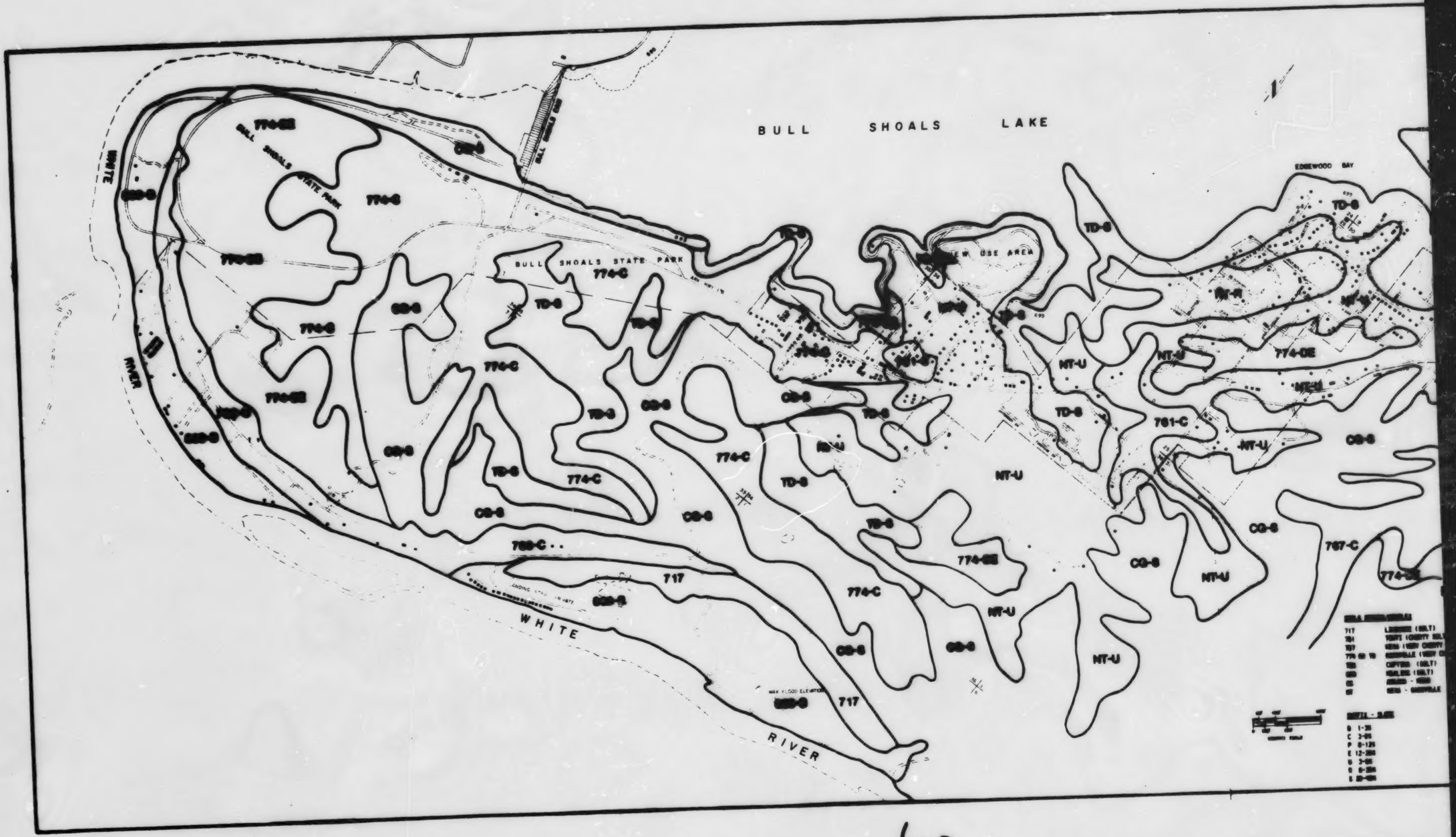

MISSOURI
Lakeview
BULL SHOALS LAKE
FAYETTEVILLE
JONESBORO
TENNESSEE
WHITE
180 miles
OKLAHOMA
FORT SMITH
ARKANSAS
MEMPHIS
LITTLE ROCK
RIVER
RIVER
RIVER
MISSISSIPPI
MISSISSIPPI
TEXAS
TEXARKANA
EL DORADO
LOUISIANA

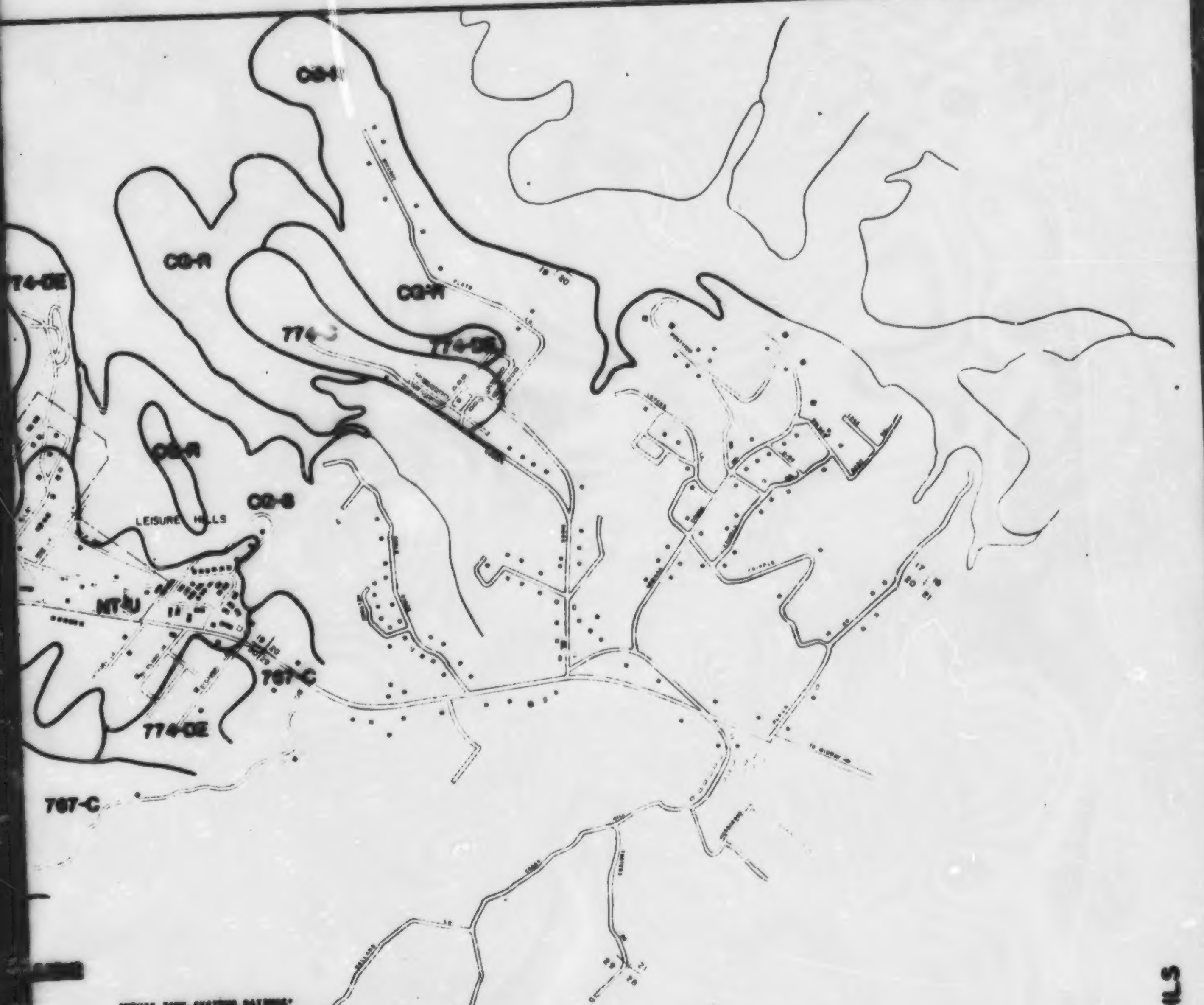
EXHIBIT 1
LAKEVIEW, ARKANSAS
LOCATION MAP

in the laboratory because of variations in the test, time of year, location, and the person making the test. All of the Lakeview area soil types, except the Healing silt found near the White River, are rated by the Soil Conservation Service as having severe limitations for septic tank system installation because of slow percolation, swelling characteristics, shallow bedrock, rock content, and slope. (See Exhibit 2.) Several of the soils have a heavy clay or other dense layer so that the top two feet may percolate satisfactorily, but further percolation downward is hindered, particularly during wet seasons, when the clays become saturated and swell. This can cause septic tank effluent-surfacing.

The depth to rock is highly irregular in the Lakeview area because of the susceptibility of carbonate rock to both solution and weathering. More than the 6-ft minimum required for septic tank systems is generally expected on the flat ridge area with the steep slopes having less cover. Contractors' reports of a minimum 6-ft soil cover may not always describe the entire absorption-field area. The topography is characterized by carbonate rock, sinkholes, subterranean drainage, solution channels, and caves. Leachate from septic tank systems percolates through this subterranean drainage system and may eventually reach a ground water aquifer. (See Exhibits 3 and 4.)

A survey was made in September and October, 1977, to determine the extent of septic-tank-system problems, with emphasis on identifying systems which have had problems. Baxter County Health Department records were reviewed and a field survey was made of the condition of about 50 septic tank systems. Information on past problems such as odor, runoff, and the tank cleaning-and-maintenance history was collected


BULL SHOALS LAKE
BULL SHOALS STATE PARK
EDGEWOOD BAY
NEW USE AREA
WHITE RIVER
MAX FLOOD ELEVATION
774-C
774-DE
TD-S
CG-S
NT-U
761-C
767-C
717
(SILT)
1-3%
C 3-8%
12-20%


CG-H
CG-R
774-DE
CG-R
774-C
774-DE
CG-R
CG-S
LEISURE HILLS
NT-U
767-C
774-DE
767-C

SEPTIC TANK SYSTEM RATINGS*

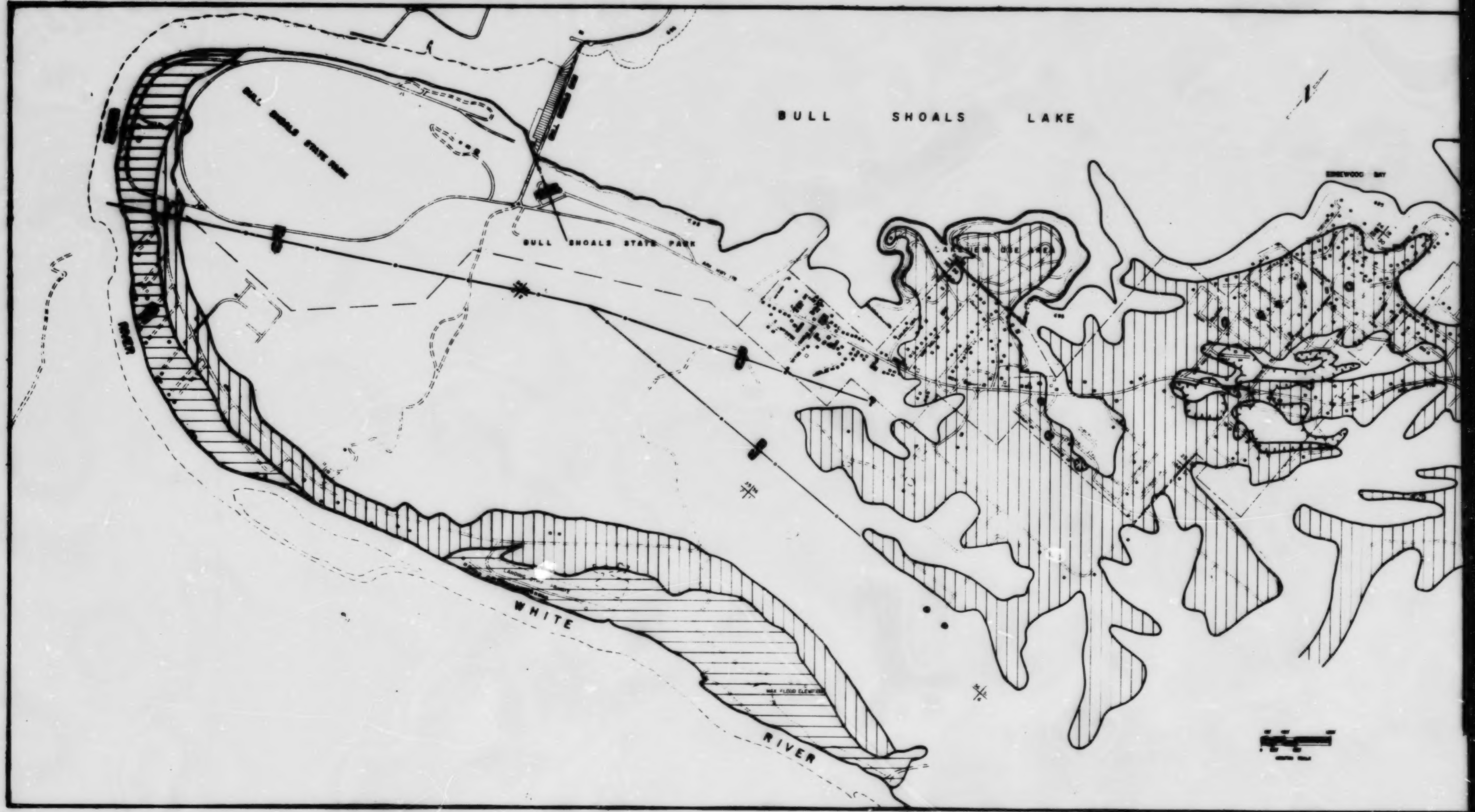
LT)
TY SILT)

SEVERE (FLOODING, WETNESS, DAMP)
SEVERE (PERCS SLOWLY. DEPTH TO ROCK APPROXIMATELY 8' TO 10')
SEVERE (PERCS SLOWLY. OFTEN STEEP SLOPES. DEPTH TO ROCK APPROXIMATELY 8' TO 12')
SEVERE (PERCS SLOWLY. OFTEN STEEP SLOPES. DEPTH TO ROCK APPROXIMATELY 6' TO 12')
SEVERE (PERCS SLOWLY. SHALLOW DEPTH TO ROCK. CLAY LAYER AT 2")
SLIGHT TO SEVERE (DEPENDING ON FLOODING)
SEVERE (PERCS SLOWLY. SHALLOW DEPTH TO ROCK. OFTEN STEEP SLOPES)
SEE RESPECTIVE SOILS

*SLIGHT - FEW OR NO PROBLEMS
MODERATE - REQUIRES SPECIAL CARE
SEVERE - USE IS HIGHLY QUESTIONABLE

EXHIBIT 2 SOILS

6b


BULL SHOALS LAKE
BULL SHOALS STATE PARK
BULL SHOALS STATE PARK
LAKEVIEW USE AREA
EDGEWOOD BAY
LANDING STATE
MAX FLOOD ELEVATION
WHITE RIVER

6C

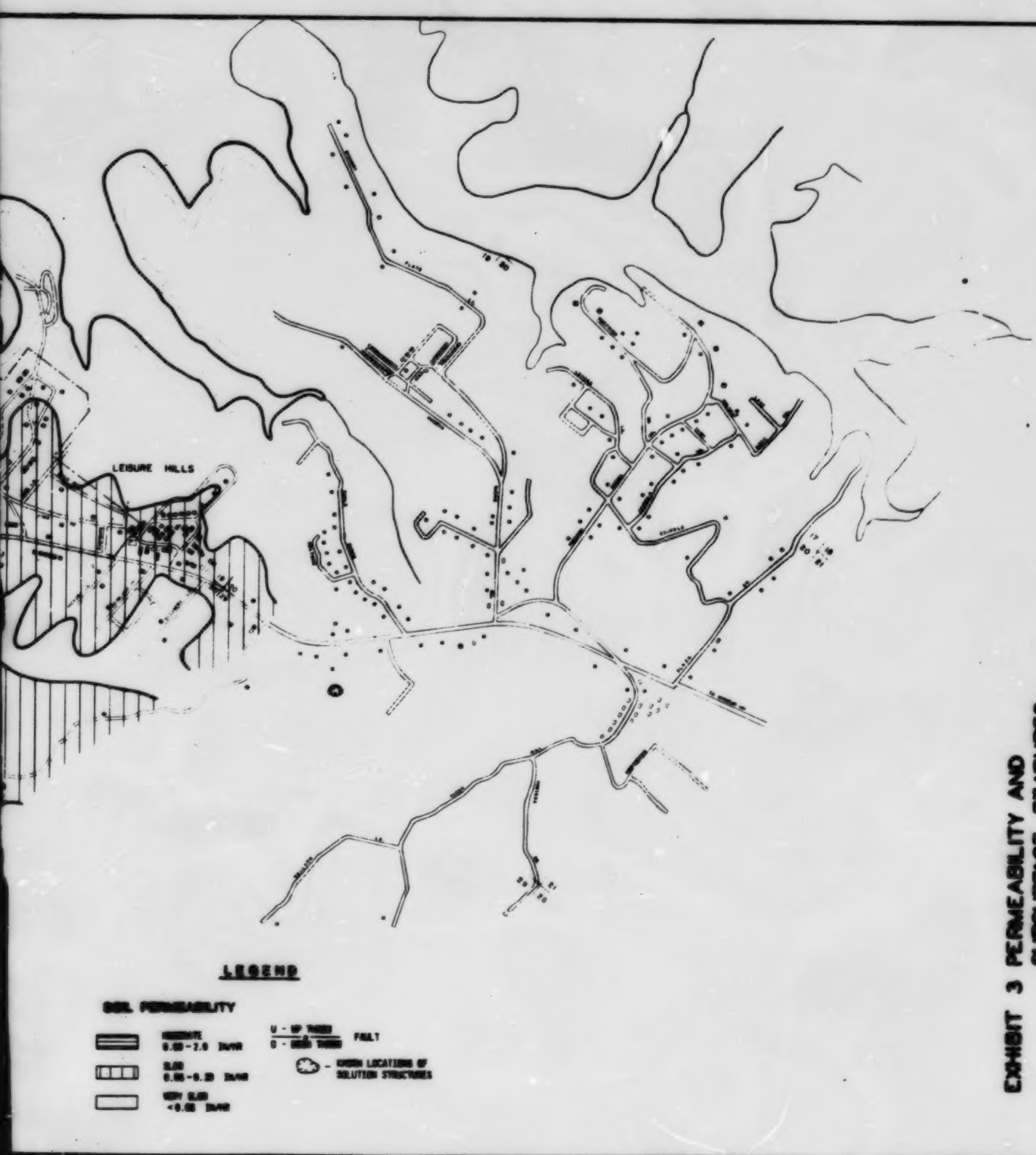
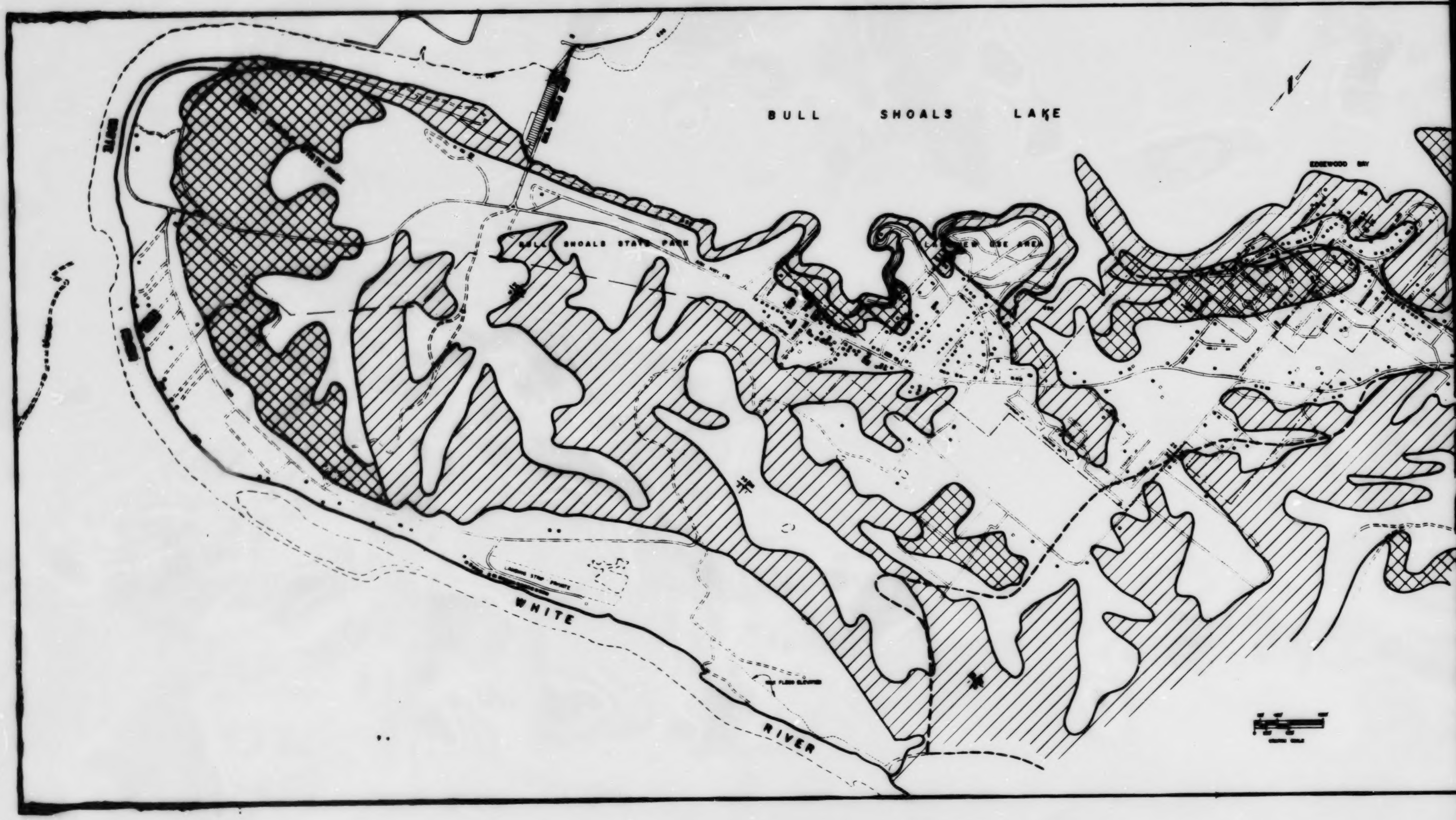

LEISURE HILLS
LEGEND
SOIL PERMEABILITY
MODERATE 0.63-2.0 IN/HR
SLOW 0.06-0.20 IN/HR
VERY SLOW <0.06 IN/HR
U - UP THROWN
D - DOWN THROWN
FAULT
- KNOWN LOCATIONS OF SOLUTION STRUCTURES

EXHIBIT 3 PERMEABILITY AND SUBSURFACE FEATURES


BULL SHOALS LAKE
EDGEWOOD BAY
BULL SHOALS STATE PARK
LAKEVIEW USE AREA
WHITE RIVER

6e

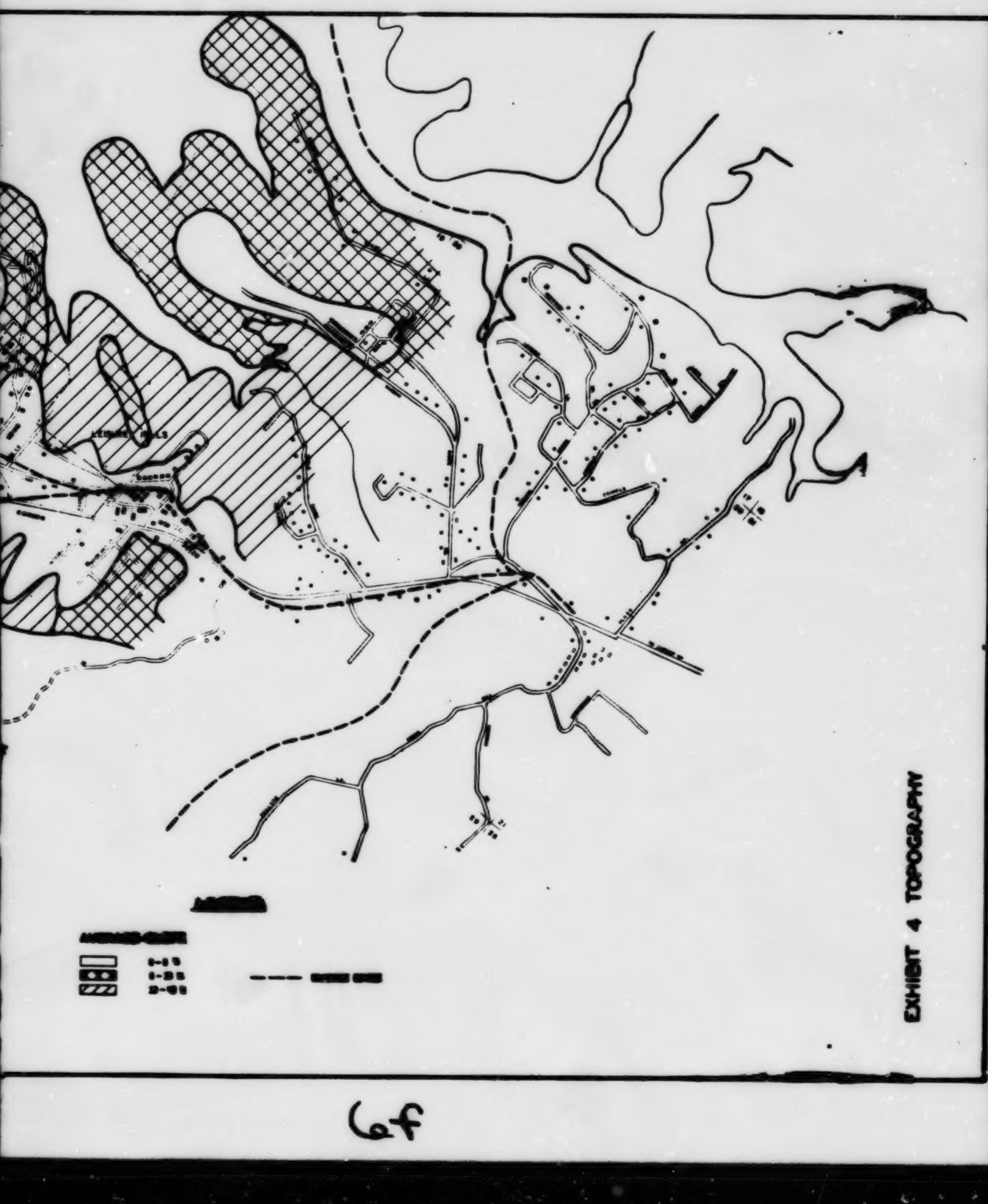


EXHIBIT 4 TOPOGRAPHY

6f

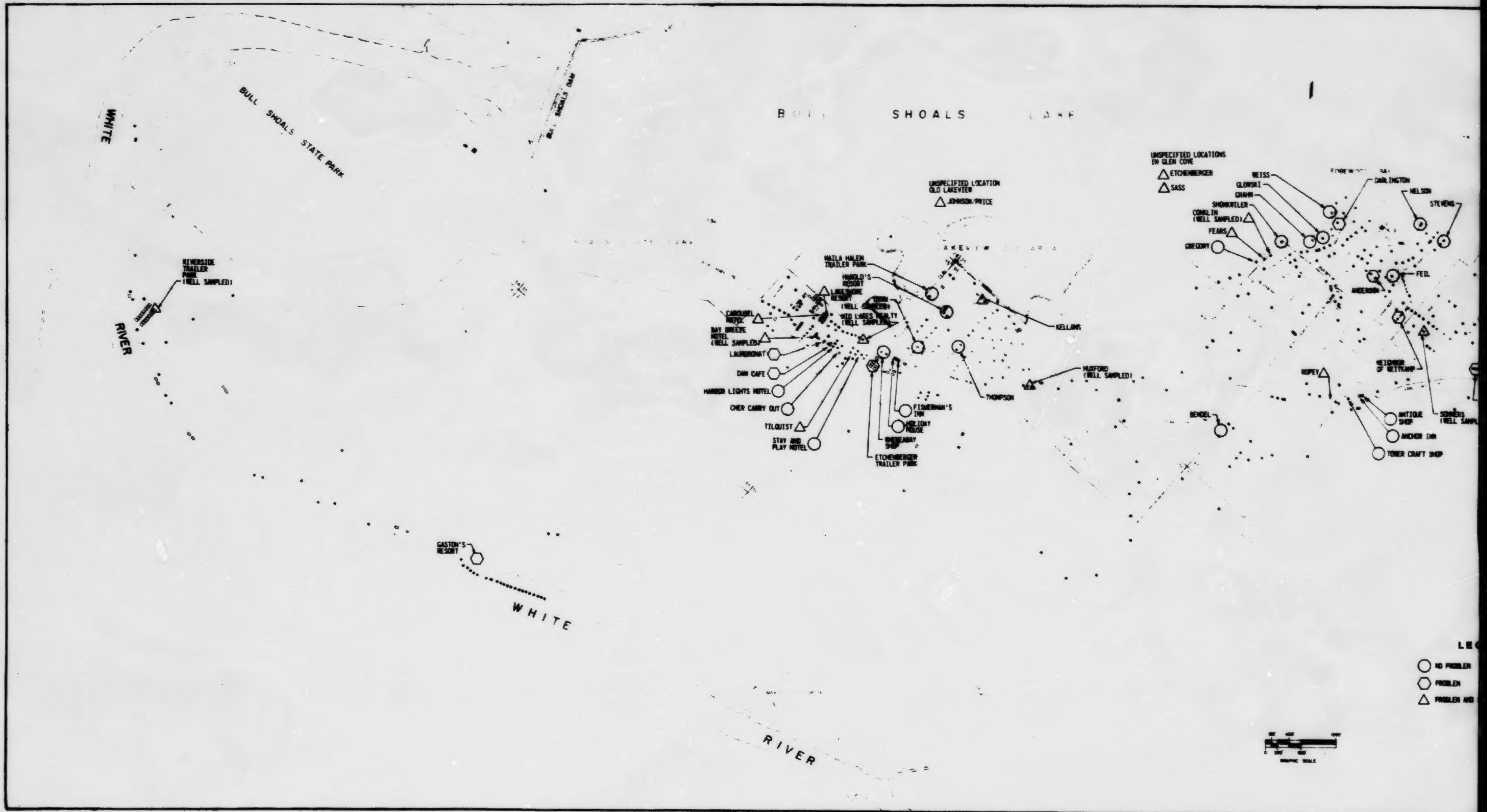
through owner meetings. The apparent absorption-field function was field checked for evidence of effluent surfacing.

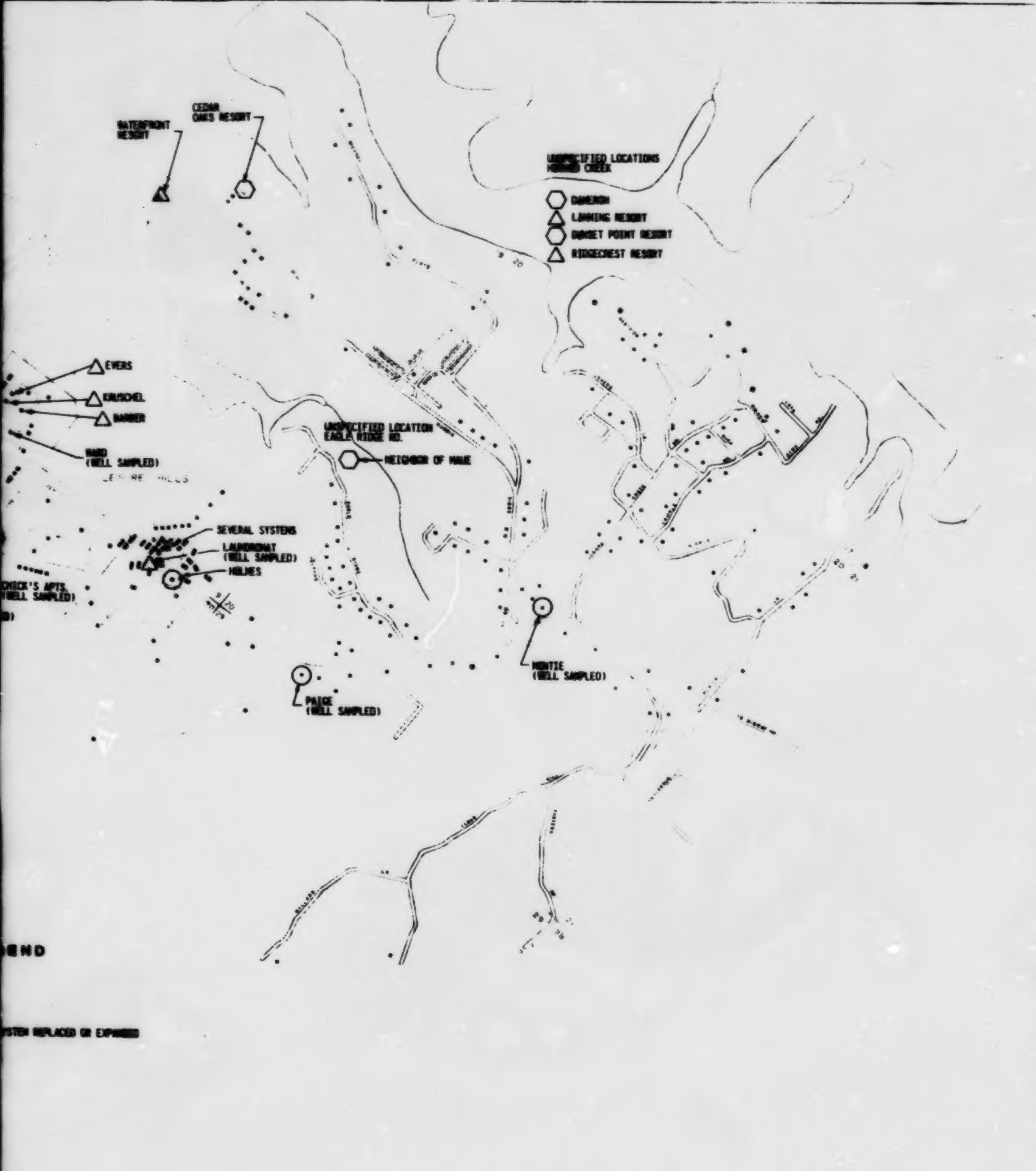
Of the 60 systems studied in the proposed project area and possible future service areas, 35 had experienced some problem, mainly backup, effluent surfacing, or odors. Twenty-three of these required rebuilding or expansion. (See Exhibits 5 and 6.) The problems with these systems were usually identified by the surfacing of septic tank effluent because the effluent was not being absorbed in the leach field. Several residents indicated their problem was caused by poor or improper initial system installation. About two-thirds of the septic tank systems surveyed in Lakeview are never pumped out according to the owners.

Information on the lot and absorption-field sizes of the residents interviewed was not always available during the survey. From the limited information available, septic tank system-problems seem to occur on residential lots of all sizes and not just on smaller lots with limited leach field areas. Commercial lots in the downtown area are relatively small, many being less than a quarter of an acre, and many of the septic tank system problems were in this area and in nearby residential lots. Survey results indicate that moderate residential and serious commercial septic tank system-problems have been experienced in the Lakeview area.

2.2 WATER QUALITY AND PUBLIC HEALTH

Baxter County health officials are unaware of any disease occurrence in the Lakeview area attributable to septic tank systems problems. The reported waterborne-type disease incidence in the County for 1974-1976 is low and does not indicate acute sanitation problems. (In assessing waterborne-disease records, authorities suggest the actual incidence may be many times the number reported.)


BULL SHOALS LAKE
BULL SHOALS STATE PARK
BULL SHOALS DAM
WHITE RIVER
WHITE RIVER
RIVERSIDE TRAILER PARK (WELL SAMPLED)
GASTON'S RESORT
UNSPECIFIED LOCATION OLD LAKEVIEW
JOHNSON/PRICE
LAKEVIEW
MAILA MALEN TRAILER PARK
HAROLD'S RESORT
LAKESHORE RESORT
CAROUSEL MOTEL
BAY BREEZE MOTEL (WELL SAMPLED)
MID LAKES REALTY (WELL SAMPLED)
LAUNDROMAT
DAM CAFE
HARBOR LIGHTS MOTEL
CHER CARRY OUT
TILQUIST
STAY AND PLAY MOTEL
ETCHENBERGER TRAILER PARK
FISHERMAN'S INN
HOLIDAY HOUSE
KELLAMS
THOMPSON
MUXFORD (WELL SAMPLED)
UNSPECIFIED LOCATIONS IN GLEN COVE
ETCHENBERGER
SASS
WEISS
GLOWSKI
GRAHN
SHOWALTER
CONKLIN (WELL SAMPLED)
FEARS
GREGORY
DARLINGTON
NELSON
STEVENS
FEIL
ANDERSON
NEIGHBOR OF WEITKAMP
ROPEY
BENDEL
ANTIQUE SHOP
ANCHOR INN
TOWER CRAFT SHOP
SOMMERS (WELL SAMPL
LEG
○ NO PROBLEM
⬡ PROBLEM
△ PROBLEM AND
GRAPHIC SCALE



WATERFRONT RESORT
CEDAR OAKS RESORT
UNSPECIFIED LOCATIONS HOWARD CREEK
DAMERON
LANNING RESORT
DORSET POINT RESORT
RIDGECREST RESORT
EVERS
KRUSCHEL
BARBER
WARD (WELL SAMPLED)
LEISURE HILLS
UNSPECIFIED LOCATION EAGLE RIDGE RD.
NEIGHBOR OF WARE
SEVERAL SYSTEMS
LAUNDROMAT (WELL SAMPLED)
HOLMES
CHICK'S APTS. (WELL SAMPLED)
MONTIE (WELL SAMPLED)
PAIGE (WELL SAMPLED)
END
STEM REPLACED OR EXPANDED

EXHIBIT 5 SEPTIC SYSTEMS SURVEY

EXHIBIT 6

SEPTIC SYSTEMS SURVEY SUMMARY

Location	Number of Systems Surveyed	Number of Systems With Problems	Number of Systems Replaced or Expanded
Commercial and Downtown Lakeview	27	13	9
Glen Cove	6	4	4
Forest Shores	4	4	4
Edgewood Bay	9	3	0
Leisure Hills	3	2	2
Gaston Road	2	2	1
Project Area Total	51	28	20
Eagle Ridge, Howard Creek and Nubbin Ridge Road Areas *	9	7	3
Total with Adjoining Areas	60	35	23

* Adjoining but not within proposed project area.

Although the Lakeview area is partially served by the Lakeview Midway Water Association which obtains its water from Lake Norfork via Mountain Home, many public and private well supplies are also used in the area. The smaller wells use the relatively shallow (to about 500 ft) Cotter-Jefferson City aquifer which is a fractured limestone formation. Pollution is a serious hazard in such formations since large volumes of pollution can enter and travel rapidly through the ground water system.

Nitrate removal by septic tank and absorption-field systems is limited. Excessive nitrates (greater than 10 mg/l) in drinking water may cause methemoglobinemia, a serious and sometimes fatal poisoning in infants. An increase in chlorides over normal background levels is another early indicator of pollution.

A sampling of twelve wells in the Lakeview area for a select group of parameters which best indicate wastewater pollution was made because of the lack of shallow ground water quality data. Seven of the wells were checked for coliform organisms. Exhibit 7 shows the well characteristics and results, with comparative values for State Department of Health analyses for public water supplies. The locations of the wells sampled are noted in Exhibit 5.

The results of the chemical sampling indicate elevated levels of nitrate and chloride in ground water near the tourist and commercial center of Lakeview, and the results correlate well with one another. Background levels of chloride and nitrate appear to be less than 10 mg/l and less than 1.5 mg/l, respectively. Concentrations up to 50 mg/l chloride and 4.6 mg/l nitrate were found. The higher concentrations did not

EXHIBIT 7
GROUNDWATER QUALITY

WELL IDENTI-FICATION	WELL CASING DEPTH (ft)	DATE SAMPLED	NITRATE As N (mg/l)	[illegible]	TURBIDITY (mg/l)	TOTAL PHOSPHATE As P(mg/l)	TOTAL ORGANIC CARBON (mg/l)	TOTAL COLIFORM (Per 100 ml)
Town of Bull Shoals	1100/500	[illegible]	< 0.01	[illegible]	0.[illegible]	-	-	-
Edgewood Bay #1	330/30[illegible]	[illegible]	0.44	[illegible]	0.3	-	-	-
Edgewood Bay #2	380/30[illegible]	[illegible]	0.[illegible]	[illegible]	0.[illegible]	-	-	-
Edgewood Bay #3	340/[illegible]	[illegible]	0.1[illegible]	[illegible]	< 0.1	-	-	-
Corps Rec. Area #100(1)	-	[illegible]-75	0.04	10.[illegible]	5.	-	-	-
Corps Rec. Area #101 (1)	-	[illegible]-75	0.[illegible]	[illegible]	3.	-	-	-
Corps Rec. Area #102	28[illegible]/-	[illegible]-76	0.53	[illegible]	10.	-	-	-
Leisure Hills Subd. - Laundromat	470/47	10-77	1.2	[illegible]	0.[illegible]	0.02	11	TNTC (4)
Chick's Apartments(1) (Rt. 178-Lakeview)	13[illegible]/-	10-77	1.[illegible]	[illegible]	2[illegible].	0.10	11	0
Riverside T. P. (Gaston Rd.)	4[illegible]0/-	10-77	- (3)	4.[illegible]	2.	0.0[illegible]	1[illegible]	10
Bay Breeze Motel (Rt. 178-Lakeview)	14[illegible] -	10-77	4.[illegible]	40.0	0.2	< 0.02	9	TNTC
Midlakes Motel & Realty (Rt. 178 & Lakeview)	300/-	10-77	2.6	11.[illegible]	0.[illegible]	< 0.0[illegible]	[illegible]	TNTC
Dunn-Boat Dock Lane(1) (Lakeview)	-	10-77	1.8	1[illegible].[illegible]	0.[illegible]	0.06	10	TNTC
Huxford-Rt. 178(1) (Lakeview)	90/-	10-77 10-77	2.7 2.7 (2)	48.7 50.7 (2)	1.7 -	0.10 0.01 (2)	7 -	TNTC -
Conklin-Deer Path Rd. (Lakeview-Glen Cove)	10[illegible]/-	10-77	1.2	[illegible].7	0.1	< 0.02	9	-
Sommers-Ravine Dr. (Lakeview-Forest Shores)	-	10-77	0.4	[illegible].7	0.3	< 0.02	15	
Montie-Howard Ck. Cutoff (Nr. Nubbin Ridge Rd. & 178)	311/24	10-77	0.9	[illegible].4	0.[illegible]	< 0.02	10	
Ward-Lake Drive (Lakeview)	216/70	10-77	0.1	6.[illegible]	1.2	< 0.02	9	-
Paige - Rt. 178 (Near Leisure Hills)	-	10-77	1.4	7.[illegible]	0.4	0.03	12	-

(1) Not used for potable water.
(2) Results by second laboratory; NO_3 by Brucine Method. (NO_3 was 3.2 Mg/l using ultraviolet spectrophotometric method.)
(3) Chlorine interference; after dechlorination satisfactory result still not obtained.
(4) Too numerous to count.

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approach the drinking water health standard of 10 mg/l for nitrate or the taste standard of 250 mg/l for chloride. Contamination largely from on-site disposal systems is strongly indicated since there are no major agricultural or other pollution sources in the vicinity. The total coliform analyses are of concern, and indicate bacteriological contamination of these private water supplies. Coliform bacteria too numerous to count were found in five wells, indicating a potential health hazard (e.g., enteric disease).

Details pertaining to local water wells such as depth, construction, and vertical zone of influence, together with data on the geological formations and porosity of subsoil strata, should be considered in determining the safe allowable distance between wells and subsurface disposal systems.

In Arkansas the location of all subsurface absorption systems must meet the following minimum distance requirements:

Public water-supply lakes	300 ft
Any source of domestic water supply	100 ft
Streams, lakes, and ponds	100 ft
Dwellings	10 ft
Large trees	10 ft
Property lines	10 ft
Water lines	10 ft

The surface-water quality of Bull Shoals Lake and the White River in the Lakeview area are excellent. (See Exhibits 14 and 15 of Section 5.2.) There have been incidents of effluent surfacing and runoff to the lake but no obvious local pollution effects or discernible water-quality changes have been noted at the monitoring stations above and below the dam. Septic tank effluent surfacing represents a potential health hazard.

2.3 GROWTH AND ASSOCIATED WASTEWATER PROBLEMS

Although the time period for basing population trends is very short, Lakeview and the surrounding region are experiencing rapid growth and the proposed project area is reasonably projected to have a 1995 population equivalent of about 3,000 as compared with 1,350 at present.* Substantial growth can also be expected in unincorporated areas adjoining Lakeview.

Population density and control are of great concern in relation to the adequacy of septic tank systems. The present population densities are on the order of two-to-four persons per acre in the residential areas. The future density may depend upon zoning requirements, septic tank leach field limitations, and real estate development plans.

More than 75 percent of the 95 residential septic tank systems installed in the Lakeview area from 1973 to 1977 were on lots of 1/2-acre or less. The residential lot sizes in Lakeview are typically in the range of 1/4 to 1/2 acre, with an average of about 1/3 acre. The minimum State requirements for septic tank absorption field area can generally be met. There are 212 existing residential units, but 555 lots have been platted within incorporated Lakeview. Since recommended minimum-lot size for septic tank system use is generally 1/2 to 1 acre or more in areas of substantial development, continued development at the established lot density will foster septic tank system problems. During wet weather, mutual interference and soil saturation from septic tank systems which are too numerous and close will occur. Ground water degradation will increase. Lot sizes will frequently be inadequate to allow expansion in case of absorption field failure. Soil limitations and the seasonal influx of tourists at the commercial establishments will further aggravate the problem.

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* Includes population equivalent for visitors to Bull Shoals State Park and Lakeview Recreation Area.

In summary, numerous septic tank systems, marginal soil conditions, rapid growth and development on rather small lots, and an aquifer formation vulnerable to pollution combine to produce a situation that is of public health and water quality concern. A moderate degree of local sanitation problems caused by surfacing of septic tank effluent has been documented.

3. ALTERNATIVES

Several possible alternatives are discussed including no action, upgrading the present on-site disposal systems, constructing a municipal collection and treatment system, and participating in a regional wastewater treatment system.

3.1 NO ACTION

The no-action alternative will result in continued installation of individual septic tank systems to accommodate growth. There is evidence from EPA survey of moderate nitrate and chloride pollution of the shallow Cotter-Jefferson City aquifer in the downtown Lakeview area. The expected area growth and development, combined with continued use of on-site disposal systems, will result in more widespread and increased pollution levels in the Cotter-Jefferson City aquifer. Organic pollutants, bacteria, and other pathogens will probably become a serious health problem, particularly with continued use of shallow-well water supplies. The deeper Roubidoux aquifer is less likely to be significantly affected by local on-site disposal practices. The deep Gunter Sandstone formation should not be influenced by local on-site disposal systems.

Septic tank development cannot be appreciably altered or limited under existing controls. Without the project or major improvements in current on-site disposal methods, increasing problems from septic tanks can be expected, resulting in further groundwater contamination, absorption-field failure with unsanitary surfacing of septic tank effluent, local surface-water contamination, difficult and costly repairs, and inconvenience. In many cases, small lot sizes will severely limit the alternative of installing new or expanded absorption fields, making corrective measures extremely difficult and expensive. Acute problems will eventually affect the public health and lessen the attractiveness of the area. This could necessitate remedial measures for wastewater management, restricted growth, curtailed water uses, or other action. In the event federal funding is not available, Lakeview will fund any improvements without federal environmental-impact review.

Without the project, the Lakeview community (including areas outside the town limits) is projected to increase from 530 to 2,270 year-round residents between 1977 and 1995, a 38.6% increase for each five-year period. Some of the factors supporting this future growth are: Lakeview and the surrounding area have grown rapidly because of mild climate and low tax rates; the location of Bull Shoals Lake combined with attractive residential development; the scenic and quiet atmosphere which makes it attractive for retired persons; Bull Shoals State Park and the White River; and the natural beauty of the physical environment that offers a wide range of recreational opportunities.

Without the project, the town should expect about 50 new multi-family dwelling units to be constructed. Septic system conditions indicate that dwelling unit density should not exceed about two dwelling units per acre. A total of 25 acres is presently zoned for multi-family development, which means that 25 two-family structures, 12 four-family structures, or 8 six-family structures could prudently be built under present conditions. However, it would be possible to build more than 50 units under existing regulations.

The no-action alternative will have the benefit of eliminating or deferring project related environmental impacts as well as any major public investment in wastewater facilities in the project area; however, it will fail to address the basic objectives of pollution control and public health laws and programs.

3.2 UPGRADING ON-SITE SYSTEMS

The septic system, though simple in concept, is actually a complex physical, chemical, and biological system. The system performance depends on design, construction techniques, waste characteristics, hydraulic loading, soils, geology, topography, and periodic maintenance. The prime function of the tank is solids reduction, removal, and storage. Removal of BOD, bacteria, and other pollutants in the tank is limited, and the effluent is malodorous and of poor quality.

The absorption-field is the most important treatment component and the element most subject to failure. Because of various clogging effects, the long-term infiltration rate of sewage into permeable soils has been shown eventually to decline to about the same negligible quantity regardless of the difference in soil permeabilities in the beginning (Cotteral and Norris, 1969). Biological factors are the most important, and the major reduction in infiltrative capacity results from an organic mat at the liquid-soil interface. Clogging varies directly with the amount of suspended solids in the tank effluent. Anaerobic (without oxygen or septic) conditions lead to further clogging through the growth of slimes and chemical deposition.

On-site disposal systems can be upgraded by using improved systems and better system management and regulation. Under the new Sewage Disposal Act regulations the Arkansas Department of Public Health allows the following reduction in the required absorption-field size for improved systems:

Dosing Tank - 10 percent, Filtration - 10 percent, Aeration - 15 percent, Curtain Drain - 5 percent. Reductions will be allowed only where on-site disposal conditions are good. Upgrading existing systems will correspondingly benefit septic tank and absorption field performance, as well as improve effluent quality. These features are not required by the Health Department and have been used very little in the Lakeview area.

Where problems with conventional septic tank soil-absorption systems have occurred, emphasis may be given to improving effluent quality to enhance soil infiltration and reduce the dependence on soils for final treatment. Of the numerous alternatives available, aeration units and intermittent sand filters seem to be the most promising. The dosing tank assists the absorption field but does not improve the quality of the applied effluent. Reduction in flow or waste strength may also increase the life of soil absorption fields although reliable criteria have not been developed.

3.2.1 Performance

The performance of different on-site disposal systems is commonly measured in terms of organics, bacteria, and solids removal. Contaminants such as nutrients (nitrogen and phosphorus) and heavy metals are only moderately reduced by any conventional form of wastewater treatment. The typical levels of organics (biochemical oxygen demand, or BOD), suspended solids, and fecal coliform bacteria are shown in Exhibit 8 for raw sewage, and septic tank, aeration tank, and sand filter effluent (Otis et al., 1977; EPA, 1977b; Bailey and Wallman, 1971). The design levels for the proposed treatment plant are given for comparison.

Coliform concentrations are still high following aeration or sand filtration. Much dependence has, therefore,

EXHIBIT 8

ON-SITE SYSTEMS PERFORMANCE

	BOD (mg/1)	Suspended Solids (mg/1)	Fecal Coliform (per 100ml)
Raw sewage	250	300+	10^6
Septic tank effluent	140-180	50-100	10^6
Aeration tank effluent*	40-60	40- 70	10^4
Sand-filter effluent	10	10	10^4
Proposed treatment plant	5	15	200

*Aeration units not meeting National Sanitation Foundation standards give lesser performance. Add-on units to septic tanks would probably not meet the standards.

been placed on the absorption field for bacterial reduction, but certain Lakeview area soils and geology do not assure acceptable performance. Considerable organic pollution can also be expected from conventional septic tank soil-absorption systems, since organics removal by soils, including many of the Arkansas soils studied (Ransom et al., 1975), is frequently limited under anaerobic conditions. The organics (total organic carbon) concentrations measured in shallow ground water in the Lakeview area were higher than are normally expected in ground water supplies (See Exhibit 7).

3.2.2 Costs*

Approximate capital and operation and maintenance (O&M) costs for the various on-site systems are given in Exhibit 9. Cost information was obtained from the literature, septic tank contractors, and the Baxter County sanitarian. The costs will be higher for installations where rock or other problems are encountered, and also for add-on units because of the more difficult and messy working conditions. A concrete septic tank was assumed to have a life equal to that of the dwelling. An average 20-year absorption-field life was assumed for conventional septic tank systems, 30 years for dosing systems, and 40 years for aeration and filtration systems. Absorption field replacement costs were increased 50 percent for add-on conditions. The filtration system is based on two filters each loaded at 5 gal/day/sq ft, with alternate loading and resting periods.

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* EPA can participate in individual systems for residences built since December 27, 1977 and occupied 51 percent of the time.

EXHIBIT 9

ON-SITE SYSTEMS COSTS

Capital	Septic Tank	Dosing System	Filtration System	Aeration System		Aeration Cluster System (30 units)(1)
Tank	$300-400	$300-400	$ 300-400	-		-
Unit	-	300-600	1500-2400	$1300-2000		$10,000
Drainfield	300-850	300-850	300-850	300-850		5,600
Total	$600-1250	$900-1850	$2100-3650	$1600-2850		$15,600
					per unit	520
					Delivery cost	200-500
					TOTAL	$720-1020
Annual O&M						
Pump-out	$15	$15	$15	$8		$100
Absorption field replacement	23-64	15-43	11-32	11-32		$140
Equipment maintenance	-	50	80-160	35		$175
Electricity	-	4	4	60		$360
Total	$30-57	$79-97	$107-200	$111-124		$775
					per unit	$26

(1)Does not include land.

Conventional septic tank systems should be pumped out at least every three years. Aeration units were assumed to double the pump-out interval to 6 years. A dosing pump was assumed to require one service call per year and replacement in 10 years.

O&M requirements generally become more important and complex with system complexity. If O&M are inadequate, the benefits of added treatment may be lost. Aeration units should be inspected at least every two months for problems such as bulking sludge (sludge that does not settle), excessive sludge buildup, clogging of the aeration system, or other system upset. Aeration units are less stable than septic tanks, and periodic upsets from surge flows or other problems can cause substantial variation in effluent quality. Maintenance for sand filter operation includes regular inspections for effluent ponding, raking to a depth of 2-4 inches after the several-month loading period and replacing the top 4 inches of sand every other rest period.

3.2.3 Cluster Systems

Groups of commercial establishments and residences might be served by cluster rather than individual on-site disposal systems. Cluster systems are eligible for construction **grants when the residences being served are occupied 51 percent of the time and were in existence on December 27, 1977.** The possibility of cluster systems serving the commercial and residential areas where septic system problems have been most common were evaluated. A typical cluster system in Lakeview serving about 30 units or 75 persons at 75-gal/cap/day will require an approximately 7500-sq-ft absorption field based on Arkansas Regulations for isolated commercial establishments. Cost estimates for such a system using aeration are given in Exhibit 9, but the costs for land, delivery, and regulation must be added. The land requirements are estimated at 3-4 acres, which will provide room for an alternate absorption field and reasonable setbacks. Delivery costs, including a local collection system, are estimated to be $200-500 per unit. The costs for a typical one-third acre platted lot in the Lakeview area is about $7,000 so that land for a 30-unit cluster system in a residential area will cost a prohibitive $63,000 to $84,000. Land in unplatted areas is reportedly about $2,000 an acre.

3.2.4 On-Site System Management

The management alternatives address the question of how on-site disposal systems can be controlled to promote the goals of water pollution control and cost-effectiveness as well as community desires. The monthly unit-costs of on-site systems were compared to the monthly charge for the proposed sewer system. (See Section 4.5.) Including an estimated $340 for hook-up, the sewer system will cost $10.45 per month. In the Lakeview area, it can reasonably be expected that existing absorption fields will require 100 percent expansion after a 20-year use-period. In many cases, additional property may be needed. Typical monthly costs for these eventualities and for upgraded septic tank systems as well as conventional systems are illustrated below.

		Monthly Cost*
Conventional septic tank system	- Capital	$ 8.50
	- Maintenance	1.25
	- Total	$ 9.75
100% absorption field expansion		$ 3.75
Added 1/6 acre land		$29.75
Upgraded septic tank system	- Capital	$21.25
	- Maintenance	10.00
	- Total	$31.25

* Capital costs at 8% interest over 20 years.

Septic tank system costs will vary greatly with individual circumstances. In general, the comparison shows the relatively low cost of conventional septic tank systems where suitable. Sunken capital costs of existing septic tank systems can not be recovered, and are in addition to project costs. However, some of the sunken costs must be written off in anticipation of the need for absorption field expansion or replacement. Where additional land and upgraded systems are required, monthly costs are greatly increased over the charge for the proposed project.

If 126 residents in Lakeview upgraded their on-site systems*, including 100% absorption field expansion with added land (assuming the land is available), the total costs would be an estimated $1,958,040. The Federal share (i.e. 75% assuming all items are grant eligible) would be about $1,468,530 and the local share about $489,510 or $16.18/month for the same 126 residents over 20 years. Since EPA can fund only the most cost-effective alternative having the least environmental impact, the Town of Lakeview may wish to pursue on-site system alternatives. Four levels of management have been identified, in order of increasing control.

Level 1 will continue existing management practices. These are minimum construction standards as required by Arkansas Department of Health Regulations. Responsibility for county-wide enforcement rests with the County Sanitarian, although authority may be delegated to municipalities and property-owner associations. Percolation tests must be performed by a qualified agent approved by the Department of Health. Limited field inspections are conducted. The regulations are clearly not intended to recommend or encourage conventional septic tank systems in areas of concentrated population. Except where nuisance conditions arise, there is little control over on-site systems already built and there are only vague options regarding advanced systems. A number of additional measures are needed if on-site systems are to be upgraded significantly and problems avoided in the Lakeview area.

* - Since 70% of the on-site systems surveyed indicated operational problems, this percentage of the population was used for comparison.

Level 2 will require upgrading all new systems to provide better effluent quality and longer system-life. Aerated tanks or sand filters will probably be required. Added personnel will be needed by the responsible agency to review plans, provide increased construction inspection, and reinspect existing systems, especially advanced units.

At this level, on-site disposal will remain the responsibility of the private citizen, but government regulation will be increased. This alternative will result in some pollution control and public health benefits, but will not address problems caused by existing systems. Current trends of land use and population density will not be directly affected.

Level 3 will require upgrading or replacing existing systems which experience problems or do not meet stringent design and lot size-requirements. All new installations will comply with a minimum residential lot size of at least 0.5 and preferably 0.75 acre, which will necessitate replatting parts of existing developments. Periodic reporting and inspection of all systems to assure proper operation and maintenance will be required.

This option will not accept past shortcomings and is basic for effectively reducing contamination and avoiding health hazards. It is not likely to be equitable, however, since the individual will be financially responsible for system upgrading and economic losses because of land-use changes and limitations. The resource, economic, and energy costs for extensive use of advanced systems will be high.

Level 4 will further establish a central management agency for on-site systems, operating as a public utility. Cluster systems can be provided where needed. The authority can maintain information on soils, water quality, and on-site system conditions; establish standards for individual wells (such as prohibition or casing depth); perform system maintenance; require a performance bond from system owners to be forfeited if there is improper operation and maintenance; require water conservation fixtures; and obtain grants or loans for cluster systems or systems not meeting standards. The agency will be supported by fees charged to those served, and some of the work might be done by private firms under contract.

The benefits of this level of management are environmental and health-protection approaching that of a central system where conditions allow. The disadvantages are the concept is relatively untried, the costs will be substantial, and implementation will be difficult. The legal procedures needed to establish such an agency are uncertain. The Town of Lakeview does not have the technical, administrative, and government resources as a foundation for such a program, and it is doubtful that the Baxter County Health Department will soon possess the resources or authority to upgrade its activities to provide such in-depth regulation of on-site systems in Lakeview or other Baxter County areas. Soil and geological conditions will limit the effectiveness and protection provided by such systems.

The inability to uniformly implement these programs will greatly diminish the potential environmental benefits. Lakeview's requirements will not cover unincorporated areas, which will have to implement parallel programs for comparable protection. Different levels of control in political subdivisions will change the expected development pattern since areas with lower or less-costly controls will probably attract more growth. Enforcement will be difficult on the local level because of intense political and economic pressures, and the public may not favor certain government activities and authorities. Thus, even if there is a concerted interest in maintaining on-site systems, many features of Levels 3 and 4 will be difficult or impossible to implement.

3.2.5 On-Site Disposal Summary

Even with upgraded on-site disposal systems, increased local ground water contamination from nitrate and chloride will take place in general proportion to growth. These constituents are not significantly removed by such systems or soils. Properly operated upgraded systems will lessen the occurrence of absorption-field failure and associated health hazards, surface water contamination, and nuisance and aesthetic problems. Organic and bacterial contamination of ground waters will also be reduced by upgraded systems.

Cluster systems are an alternative for isolated developments in problem areas. The use of cluster systems in the Lakeview area will be limited by nitrate and chloride contamination of ground water, and by land requirements to avoid saturated soil conditions. Also, providing such systems for a static community is more economical and manageable than for a community as Lakeview with its rapid growth and seasonal tourist population. As density of development increases, more cluster systems will be needed in emerging problem areas, but land availability will be reduced. Cluster systems would best be planned and installed in advance of much development to assure land availability and avoid duplication of costs for switching from individual systems. This will require a substantial long-term economic, land use, and facilities commitment which, except for land, will not be recovered if it were decided to install a central sewer system in the future.

A major difficulty in providing upgraded on-site systems will be establishing proper management authority. The authority should have power to plan, design, construct, own, operate, inspect, manage, and maintain all wastewater systems within its jurisdiction. The authority may also require extra-territorial jurisdiction through state statute, case law, or contract. Other powers needed include those to assume debt obligations and raise revenue through user charges, special assessments, or taxes. The authority also ought to have the power to set and enforce rules and regulations for on-site systems and meet eligibility requirements for loans and grants from the state and federal governments.

Long-term reliance on upgraded on-site systems in the Lakeview area has serious economic and environmental drawbacks and will pose many management difficulties.

3.3 REGIONAL WASTEWATER SYSTEM OR CONNECTION TO BULL SHOALS PLANT

There is no existing or planned regional wastewater system in the Baxter-Marion County area. A regional system could be designed around Mountain Home (some 15 miles southeast of Lakeview) or it might be designed to serve development around Bull Shoals Lake. The low population density of much of the area and the rugged and rocky terrain, however, make such large regional systems economically unfeasible for the foreseeable future.

A wastewater collection-and-treatment system for the Town of Bull Shoals (three miles across the dam from Lakeview) is nearing the construction stage. The treatment plant and discharge point will be on the White River about one mile below the dam. The most feasible means of connecting to the Bull Shoals system is by crossing the White River below the dam. A break in the line or other failure resulting in a raw sewage discharge to the White River would cause serious pollution and pose a significant hazard to downstream water supplies. Therefore, any crossing would need to be designed and constructed in a fail-safe manner to assure minimal risk. Routing across the dam or lake would be more expensive because of greater distances, the lake depth, difficult topography, and the problem of delivering wastewater collected in the Bull Shoals State Park and Gaston Road areas below the dam. The estimated cost of connecting to the Bull Shoals system is $173,500 ($213,500 less $40,000 for eliminating approximately 4,100 ft of proposed 12-inch sewer line for delivering wastes to the Lakeview plant). (See Exhibit 10.) However, the $173,500 net cost does not include the cost of expanding the Bull Shoals treatment plant. Expanding the Bull Shoals system to handle the added 0.3 mgd design flow from Lakeview is estimated to cost $290,000, compared to the $497,500 estimated cost for the Lakeview treatment system alone.

At a March, 1978 meeting, officials of both Bull Shoals and Lakeview clearly indicated they were not interested in interconnection of the two systems. The Town of Bull Shoals does not wish to delay their project or assume the administrative burdens of interconnection. Similarly, Lakeview officials preferred an independently operated system. In summary, connecting the Lakeview and the Town of Bull Shoals systems does not appear to be politically feasible. Even without physical interconnection, Lakeview and the Town of Bull Shoals may find it desirable to consolidate some operational functions and personnel, and thus provide better and more efficient operational services.

EXHIBIT 10

PRELIMINARY COST ESTIMATE
for
CONNECTING THE LAKEVIEW AND BULL SHOALS SEWER SYSTEMS*

ITEM	DESCRIPTION	APPROX. QUANTITY	UNIT PRICE	TOTAL COST
1	Pump Station	1 ea.	L.S.	$ 40,000.00
2	8" ductile-iron force main	16,000 lin ft	$ 9.00	144,000.00
3	8" river crossing	1,000 lin ft	25.00	25,000.00
4	Rock excavation	100 yd^3	13.50	1,350.00
5	Bedding	200 yd^3	7.00	1,400.00
6	Concrete encasement	15 yd^3	50.00	750.00
7	Air relief valves	2 ea	500.00	1,000.00

TOTAL ESTIMATED CONSTRUCTION COST $213,500.00

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* From Engineering Services, Inc. (See letter of December 1, 1977, Appendix A, p. 15).

3.4 MUNICIPAL WASTEWATER SYSTEM DESIGN ALTERNATIVES

a. Wastewater Reuse and Land Application

Wastewater reuse is not a viable alternative in the Lakeview area because of the abundant high quality water resources available. There are no industries or irrigable lands to provide potential users and demand for reclaimed effluent.

Land application is a possible alternative to treatment and discharge. The primary benefit would be avoiding surface water discharge to the White River or Bull Shoals Lake. The soil, bedrock, and geological conditions as discussed in relation to septic tank systems also limit land application alternatives in most of the area. Soils with low infiltrative and percolative capacity, fragipans, and insufficient depth to rock are not well suited to such treatment systems. Sink holes, faults, and fractures which may provide short circuiting to the groundwater and nearby water supply wells are also undesirable. The soils best suited for land application in the Lakeview area appear to be the Healing series found in the White River bottom. Land application could reduce the effect of direct discharge to the White River although as discussed in Section 5.2.2, serious adverse effects are not expected. The costs will depend upon required pretreatment and a preliminary evaluation of land treatment feasibility and design. At least primary and perhaps secondary treatment would be necessary before land application. The costs for land application will include about 75 acres of land, transmission, field preparation, storage, distribution and operation and maintenance. There may be small but appreciable environmental benefits, however, a cost advantage over treatment-discharge alternatives is unlikely. Nearby recreation on the White River and commitment of a large tract of a scarce land resource are serious adverse factors.

b. Treatment and Discharge

White River discharge limitations at Lakeview are 15 mg/l total suspended solids, 5 mg/l BOD, and 200 fecal coliform bacteria/100 ml. The treatment and discharge system alternatives are as follows:

1. A contact stabilization activated-sludge plant followed by disinfection and sand filtration. This alternative consists of bar screening, aeration, reaeration, secondary settling, disinfection, and sand filtration with aerobic sludge digestion followed by sand drying-bed dewatering and burial.

2. A trickling-filter plant followed by disinfection and sand filtration. This alternative consists of bar screening, grit removal, primary settling, trickling filtration, secondary settling, disinfection, and sand filtration, with anaerobic sludge digestion followed by sand drying-bed dewatering, and burial.

3. An aerated lagoon followed by sedimentation, disinfection, and sand filtration. This alternative consists of bar screening, aeration in a facultative lagoon, secondary settling, disinfection, and sand filtration with sludge removal and burial at infrequent 10-20 year intervals.

Alternative 3 was selected as the most practicable because of its proven ability to meet effluent standards, simplicity, ease of operation, and capital and operating costs. There has been no major question concerning the adequacy of Alternative 3 in either meeting discharge requirements or representing a reasonable treatment-discharge system although the proposed system will be revised to include chemical precipitation before filtration and dechlorination in response to comments by the Arkansas Department of Pollution Control and Ecology.

c. Ozonation Alternative

To avoid toxic effects of chlorine on aquatic life, ozonation of wastewaters is an alternative solution to chlorine disinfection and dechlorination (see Section 5.3.5). While ozone is finding acceptance in a few full-scale plants, there is a paucity of toxicity data for ozonated effluent at this time. Actual operational waste-treatment conditions in Michigan indicate ozonated effluent had no significant effect on fathead minnow reproduction, growth, or survival. Nebel et al (1973) reported no mortality of bass, perch, minnows, and goldfish exposed to undiluted ozonated effluent during a 6-week pilot-plant study at a Kentucky treatment plant. These same species did not survive in nondisinfected secondary effluent.

d. Site Alternatives

Two site alternatives have been identified - the proposed site on the White River, and an alternative site on Bull Shoals Lake near the western boundary of Lakeview, (see Exhibit 12 in Section 4). The Bull Shoals Lake site was rejected because of the need for added nutrient-removal treatment (based upon informal discussion with the Arkansas Department of Pollution Control and Ecology), its proximity to the heavily used Lakeview Recreation Area, discharge to important contact-recreation waters, and nearby residential areas. The White River site also has the advantage of potentially serving the Bull Shoals State Park and Gaston Road areas below the dam without costly pumping to the lake site. Through coordination with the Arkansas Archeological Survey, there will be no adverse archeological impact from the project.

Nutrient removal requirements are decided on a case-by-case basis; however, the general policy of the Arkansas Department of Pollution Control and Ecology is to require nutrient removal for discharge to lakes because of concern for nutrient enrichment. Bull Shoals Lake followed a characteristic path of very high fertility and associated fish productivity the first few years after impoundment followed by a steady decline and then stabilization. Fish productivity will continue to fluctuate within a narrower range depending on the varying abundance of nutrients and plankton. Bull Shoals Lake has been characterized as mesotrophic, a condition between eutrophic (nutrient enriched and high in productivity) and oligotrophic (very low in nutrients). The lake approaches oligotrophic conditions and is known for its clear waters, an indication of low nutrient-enrichment. The nutrients supplied by discharge to Bull Shoals Lake would be beneficial for local fish productivity by providing added plankton, which is food for shad and bass fingerlings. Because of the local nature of the discharge and great dilution, however, the overall effects on the Bull Shoals fisheries biota will probably be negligible.

While nutrient removal from any Lakeview area discharges to Bull Shoals Lake may not be critical, for long-term protection of the high-quality waters and in view of increasing lakeshore development, nutrient removal appears to be a sound policy. The other drawbacks to the lake site are also valid and important and, on balance, the White River discharge is preferable.

e. Service Area Alternatives

An important consideration in the project's economic feasibility and environmental impact is whether proposed service areas beyond the Lakeview corporate limits will participate. Decisions involving Bull Shoals State Park, the Corps of Engineers (COE) Lakeview Recreation Area, and the developments of Edgewood Bay and Leisure Hills will require project evaluation in terms of individual needs and circumstances.

A small package sewage treatment plant with discharge to the White River serves Bull Shoals State Park. Large fluctuations in flows have resulted in operational difficulties and odor problems. The plant is designed for easy relocation if the park is connected to the Lakeview system. The Arkansas Department of Parks and Tourism has indicated it is usually advantageous to tie their state parks into a local wastewater system, however, further study and cost information from the Town of Lakeview will be needed before a firm commitment is given.

The sanitary facilities at the COE Lakeview Recreation Area consist of four vault-toilet restrooms, a sanitary trailer dump-station, and a change shelter with six showers. Two more restrooms and converting a vault restroom to water-carriage with showers are planned. The estimated total sewage flow from the existing facilities is 16,000 gpd (if all are water-carriage), with an additional 7,000 gpd for the two planned restrooms. The COE does not consider the current practice of transporting waste from the Lakeview Recreation Area to the Norfork lagoon system to be an acceptable long-term arrangement. Possible alternatives include providing a central treatment system for the park, or connecting to a regional or local sewage treatment system. Under current COE policy, new construction of recreation facilities at existing projects is by cost-sharing with a non-Federal public entity which will assume the operation and maintenance responsibilities. User-fee funds may be used to convert vault restrooms to waterborne restrooms and to provide for showers. A decision on COE participation will be based on cost and priority funding needs. COE participation will be limited to a reasonable part of the first cost of the new plant but will not include a monthly user-fee payment.

Based on membership vote, the Leisure Hills Homeowners Association previously indicated interest in advancing a wastewater disposal system for the area. The Edgewood Bay

Association expressed its cooperation to secure project approval by letter from its officers; the validity of this letter was contended, however, because the Association members did not authorize or vote on the decision. While there has been no further commitment from these agencies or groups, positive interest and need is sufficient to plan service to these areas. Commitments should be obtained early in the planning process, as further cost and other information is made available. The estimated monthly charge would increase from $10.45 to $12.49 if the State Park and COE Recreation Area are not included.

3.5 ALTERNATIVES AVAILABLE TO EPA

The alternatives available to the EPA are issuing the grant or denying the grant.

Issuing the grant for the proposed project will result in eliminating increasing public health hazards, water quality degradation and inconvenience (problems with failure, absorption field expansion, and maintenance) from septic tank systems in the project area. Substantial economic, material, manpower, and energy resources will be committed to the project, representing (for all practicable purposes), an irreversible commitment to a sewage collection-and-treatment system for the Lakeview area. The short-term economic benefits will consist of construction employment opportunities and secondary economic stimulation; however, much of the effect will be felt outside the Lakeview area. The adverse short-term effects include noise, dust, and traffic disruption because of construction, but these will be controlled within tolerable limits. With reasonable precautions, direct effects on aesthetics and the biological environment including fish, birds, vegetation, and terrestrial species will also be minor. The project's secondary effects on growth and development will not be great, within the project design period, but the ultimate rate of development and density will be altered because of the increased value and the accelerated development of unplatted areas and the avoidance of future sanitary and environmental growth-constraints from septic tank systems. The project cost as reflected by an estimated average monthly cost of $10.45 will not be excessive compared to similar collection and treatment systems.

To avoid adverse effect on archeological resources, an addendum to the Facility Plan will require shifting the treatment plant site so the eastern boundary coincides with test pit XU3. Notifying the Arkansas Archaeological Survey of construction of the lines in the valley will also be required.

In general, EPA can issue a grant to fund any of the feasible alternatives as evaluated in the EIS, including septic tanks, and a Step 1 Facility Plan Ammendment could propose another plan if cost-effective.

Grant denial will result in the "no-action" alternative with continued adverse environmental impact from groundwater contamination and incidence of unsanitary conditions. Project related environmental impacts and commitment of public resources for wastewater management will be avoided or deferred, but private resources will be needed to install, maintain, repair, and upgrade the many septic tank systems in the area.

EXHIBIT 10-A
COMPARATIVE EFFECTS OF ALTERNATIVES

	No Action	Proposed Project	Upgraded On-Site Systems
Economics	$5.00/mo/unit for maintenance and field replacement $8.50/mo capital cost for future systems*	Total Cost - $2,041,000 EPA - $1,466,000 Local - $ 489,000 Unit Charge $10.45/mo **	Individual-approx. $30/mo capital and O&M plus any added land costs*; Cluster systems-approx. $10/mo/unit capital and O&M plus land costs*
Community Effects and Growth	No community disruption from construction Continued growth to estimated 3000 population by year 1995	Community disruption during construction Same growth to 3000 by 1995 with increased development and density beyond 1995	Individual or localized disruption from construction Growth same as "no action" but without land committed to waste disposal
Water Quality and Public Health	Increasing ground and surface water contamination and public health risk	Prevent increasing water quality degradation and septic system failures Will meet stream standards	Lesser water quality degradation and health risk than "no action" but satisfactory sites are limited.
Biology	No significant construction and operation impacts	Causes construction and operation impacts	Minor localized construction impacts
Archeology	No effects	No effects as amended	No effects

* EPA may participate in some cases thus reducing owner cost.

** The estimated monthly charge would increase from $10.45 to $12.49 if the State Park and COE Recreational Area are not included.

4. DESCRIPTION OF THE PROPOSED PROJECT

4.1 TREATMENT SYSTEM

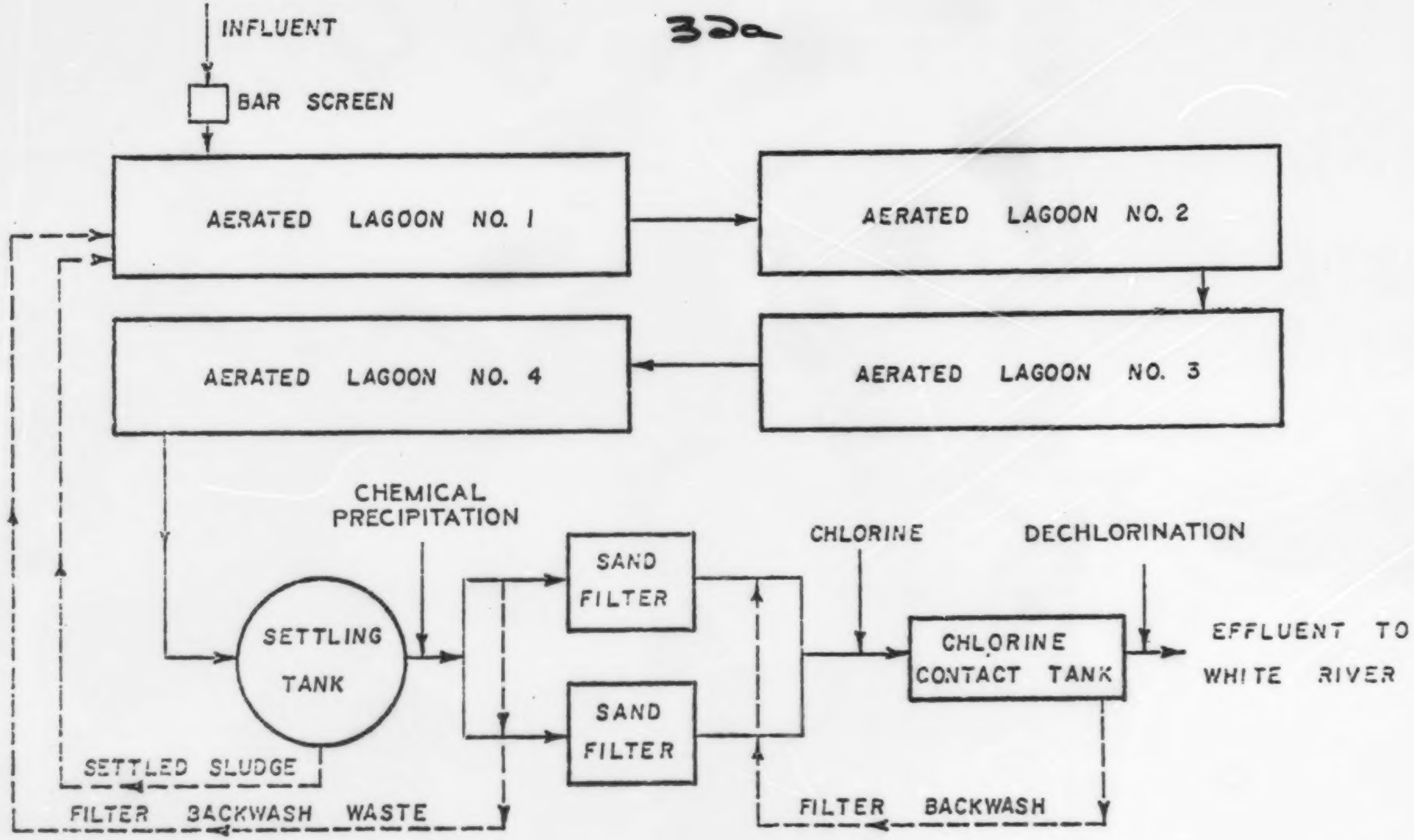
The proposed treatment plant is designed to serve 3,000 persons at 100 gallons per-capita per day (gpcd) for an average wastewater flow of 300,000 gallons per day (gpd) in the 1995 design year. The effluent limitations are 5 mg/l BOD, 15 mg/l suspended solids and 200 fecal coliform/100 ml, with discharge to the White River about 5 miles below Bull Shoals Dam. The present (1977) wastewater flow is estimated at 135,000 gpd, based upon a population equivalent of 1,350 persons at 100 gpcd. The 100-gpcd figure reasonably reflects water use of about 75 gpcd for the Lakeview-Midway and Edgewood Bay Water associations plus a transient population increment of 120 gpd (2 persons @ 60 gpcd) per motel unit.

Treatment plant unit processes with costs as shown schematically in Exhibit 11 are:

Flow measurement		
Bar screen		
Aerated lagoons - 4 units with 48-day combined detention time	-	$300,000
Pump station	-	30,000
Secondary settling tank - 3 hours detention time	-	35,000
Disinfection - 15 minute contact time	-	10,000
Rapid sand filtration - 2 units at 5 gpm/ft^2	-	75,000
Also: Equipment building	-	40,000
Fencing	-	7,500
Total		$497,500

The disinfection and filtration units will be sized to handle an expected peak flow of 1,250 gpm. Dechlorination

32a



INFLUENT
BAR SCREEN
AERATED LAGOON NO. 1
AERATED LAGOON NO. 2
AERATED LAGOON NO. 4
AERATED LAGOON NO. 3
CHEMICAL PRECIPITATION
SETTLING TANK
SAND FILTER
SAND FILTER
CHLORINE
DECHLORINATION
CHLORINE CONTACT TANK
EFFLUENT TO WHITE RIVER
SETTLED SLUDGE
FILTER BACKWASH WASTE
FILTER BACKWASH

SCHEMATIC OF TREATMENT FACILITY
LAKEVIEW, ARKANSAS

SOURCE:
FACILITY PLAN WITH UPDATE

EXHIBIT 11

or alternate means of disinfection and chemical precipitation before filtration will be required by the Arkansas Department of Pollution Control and Ecology. The treatment plant will be equipped with an auxiliary power generator to be used during periods of extended power failure. The total estimated cost for the treatment plant is $497,500*.

4.2 COLLECTION SYSTEM

The collection system will serve the Town of Lakeview, Edgewood Bay, Leisure Hills, Bull Shoals State Park, the Lakeview Recreation Area and the Gaston Road area. It will consist of about 68,000 lin ft of 8-inch, and 22,000 lin ft of 10-inch gravity collectors and interceptor sewers. Also included in the collection system are four sewage pump stations and approximately 11,300 ft of force main. The main line to the treatment plant will consist of approximately 16,500 lin ft of 12-inch gravity sewer. Exhibit 12 is a layout map of the proposed collection system. The collection system costs are estimated at $1,103,000.

4.3 LAND AND OPERATION AND MAINTENANCE REQUIREMENTS

The treatment plant will require about eight acres of land, and four very small parcels of land probably totaling less than one-fourth acre will also be required for the pump stations.

One full-time and one part-time person will be required to properly operate and maintain the proposed system. The annual operation and maintenance cost is estimated at $20,000 for the treatment plant and $20,000 for the collection system.

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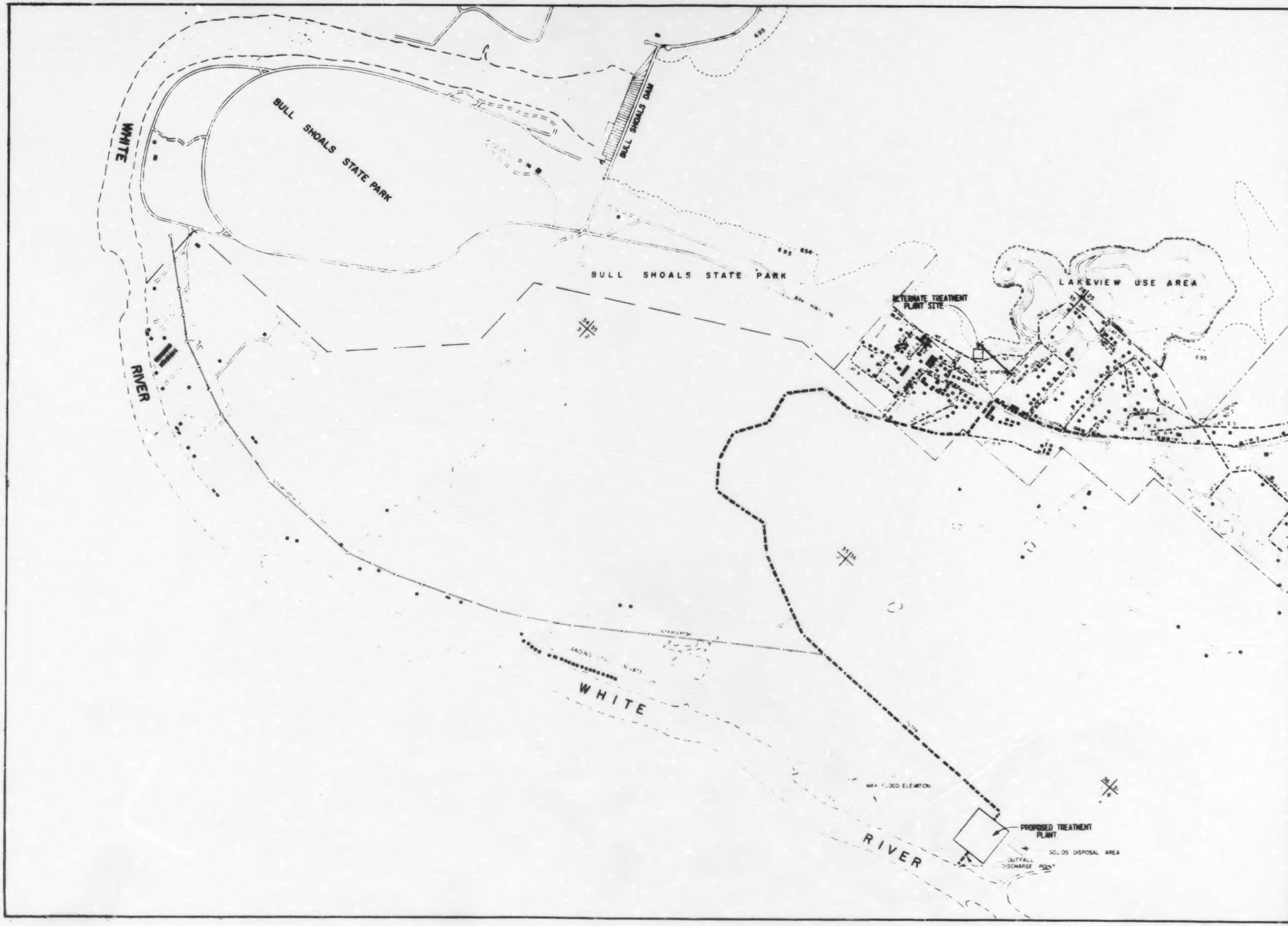
* Does not include dechlorination or alternate means of disinfection.


WHITE
RIVER
BULL SHOALS STATE PARK
BULL SHOALS DAM
695
693
654
BULL SHOALS STATE PARK
ALTERNATE TREATMENT PLANT SITE
LAKEVIEW USE AREA
695
PUMP STATION
MAX FLOOD ELEVATION
WHITE
RIVER
PROPOSED TREATMENT PLANT
SOLIDS DISPOSAL AREA
OUTFALL DISCHARGE POINT

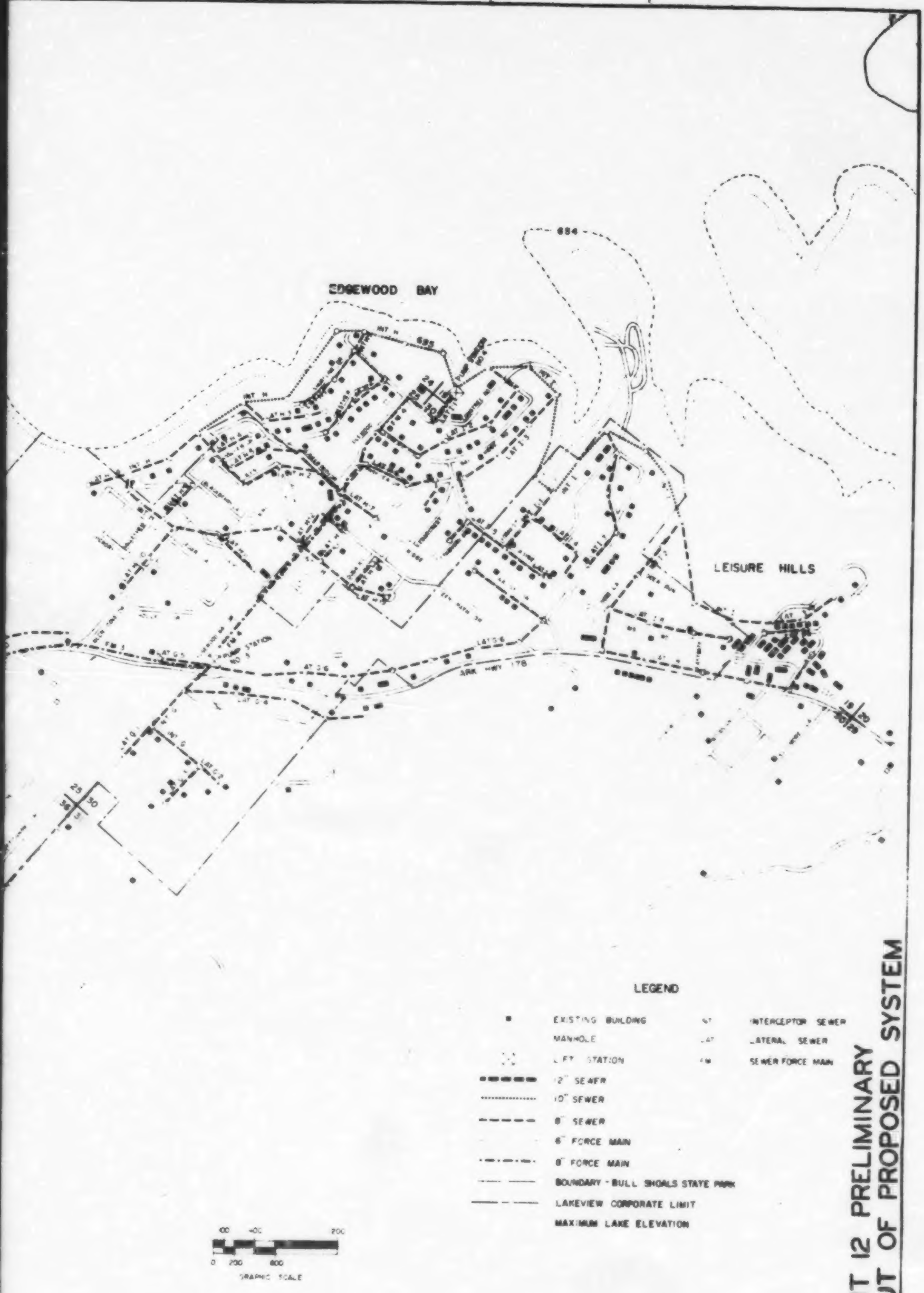

EDGEWOOD BAY
654
LEISURE HILLS
ARK HWY 178
LEGEND
EXISTING BUILDING
MANHOLE
LIFT STATION
12" SEWER
10" SEWER
8" SEWER
6" FORCE MAIN
8" FORCE MAIN
BOUNDARY - BULL SHOALS STATE PARK
LAKEVIEW CORPORATE LIMIT
MAXIMUM LAKE ELEVATION
INT
INTERCEPTOR SEWER
LAT
LATERAL SEWER
FM
SEWER FORCE MAIN
0
200
800
GRAPHIC SCALE

EXHIBIT 12 PRELIMINARY LAYOUT OF PROPOSED SYSTEM

SOURCE: LAKEVIEW FACILITY PLAN

4.4 CONSTRUCTION SCHEDULE

An estimated six months will be required to complete detailed plans and specifications from the time of the Step-2 grant. A four-month period is then estimated for administrative and bidding procedures followed by a one-year construction period.

4.5 COSTS

Based upon comparing the cost information for Lakeview with actual bid prices for the Cotter-Gassville system and other available cost information (EPA, 1978; Means, 1978), the estimated costs are shown below. Cost increases can be expected because of inflation. Chemical precipitation costs are included.

Total estimated construction cost	$1,601,000
Contingency	160,000
Engineering	184,000
Legal and administrative	10,000
Land and right-of-way	25,000
Interest during construction	61,000
Total Project Cost	$2,041,000

An estimated annual income will be required to finance Lakeview's share of the project cost (see Exhibit 13). The unit count is based on the number of residential and commercial structures in 1977 and those anticipated for 1995 for the town, plus the areas outside the town limits to be served by the project (including an equivalent for Bull Shoals State Park and the Lakeview Recreation Area).

The average per-unit cost for 1977 will be approximately $10.45 per month or $125.40 per year. As connections

EXHIBIT 13

FINANCING AND COST OF PROPOSED SYSTEM

Total initial cost	$2,041,000
Less land cost (ineligible)	25,000
Less interest during construction (ineligible)	61,000
Grant base	$1,955,000
Maximum EPA grant - 75%	1,466,000
Minimum City portion	$ 489,000
Plus land cost	25,000
Plus interest during construction	61,000
TOTAL CITY PORTION	$ 575,000
FHA Loan for 40 years @ 5% interest	
$455,000 @ 38 years - i = 5% (16.868)	34,088
(2 years deferred payments)	
Plus 10% coverage	3,409
ANNUAL PAYMENT	$ 37,497
Annual Operation and Maintenance Cost	
Operation and maintenance (ESI estimate)	$ 40,000
Sinking fund cost	6,700
	$ 46,700
ANNUAL INCOME REQUIRED	$ 84,197

EXHIBIT 13 (Continued)

Per-Unit Cost:		Project Costs	Total* Costs
1977:	$\frac{\text{\$84,197/yr}}{\text{(12 mo/yr) (777 units)}}$	= $9.03/mo	$10.45/mo. **
1995:	$\frac{\text{\$84,197/yr}}{\text{(12 mo/yr)(1583 units)}}$	= $4.43/mo	$ 5.85/mo

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* Includes estimated cost of $340 for the private sewer line hook-up and filling existing septic tanks with gravel.

** The estimated monthly charge would increase from $10.45 to $12.49 if the State Park and COE Recreational Area are not included.

are added to the system the per-unit cost will decrease to $5.85 per month by 1995. Based upon volume of flow, the average unit cost of $10.45 per month corresponds to wastewater volume of approximately 6,000 gal.

5. ENVIRONMENTAL IMPACTS OF THE PROPOSED PROJECT

5.1 GEOLOGY, SOILS, AND TOPOGRAPHY

5.1.1 Effects of Construction on Geology, Soils, and Topography

Constructing the project will have minor short-term adverse impacts on soils. Some topsoil loss will occur once the vegetation is removed and excavation takes place. While the topsoil is quite thin in the Lakeview area, the rock content of the soil will help prevent some erosion. Mitigative measures during construction will include limiting the length of open trenches to 500 ft and installing the pipe within as short a time period as possible. In addition, landscaping will closely follow the completed construction with leveling and seeding to protect the areas from additional erosion and soil loss.

Construction activities will alter the topography of areas required for the aerated lagoons and treatment facilities at the proposed plant site. Collection system excavation will cause a minor short-term impact, but after backfill and landscaping, the original appearance should be attained.

There are no known mineral or petroleum resources (e.g., oil, natural gas, coal, uranium, sulfur, or sand and gravel) to be impacted by construction of the proposed project. Blasted rock will be disposed of in an approved fill area or other unobjectionable location.

5.1.2 Effects of Operation on Geology, Soils, and Topography

Implementation of the proposed project will result in the abandonment of existing on-site systems which will result in an indirect loss of soil nutrients and moisture in the immediate absorption-field areas of septic tanks. To maintain lawn appearances, additional watering and fertilization may be necessary.

5.2 HYDROLOGY

5.2.1 Surface Water Setting

Bull Shoals Lake and the White River are the important and inseparable surface-water features of the Lakeview area. Lakeview is situated on a northeast-southwest-oriented ridge with surface drainage to the northwest into Bull Shoals Lake or to the southeast into Bruce Creek. All drainage eventually reaches the White River. The river streamflow in the Lakeview area is almost completely controlled by the operation of Bull Shoals Dam. Power is normally generated only during peak-demand periods, which causes large flow-fluctuations over any selected time interval. The average flow for the past 48 years has been 6,093 cfs at the U.S. Geological Survey (USGS) gauging system on the White River near Flippen, 11.5 miles downstream from the dam.

The environmental effects wastewater discharges have on receiving streams are most critical during low-flow periods. The house generating-unit, which provides power for the dam and powerhouse, runs almost constantly and releases about 50 cfs. Leakage from the lake to several springs downstream from the dam provides another 60 cfs for a total of 110 cfs that can be considered a constant minimum-flow (Army Corps of Engineers, 1973). The Corps of Engineers cooperates in maintaining the cold-water trout fishery during the summer, using the following guidelines for minimum average daily releases depending upon maximum air temperature (Little Rock District, Corps of Engineers):

90°F or below	250 cfs
91- 95°	375 cfs
96-104°	500 cfs
105° or greater	750 cfs

Instantaneous releases may be lower. The 1- and 7-day low flows at a recurrence interval of 10 years are 158 and 324 cfs, respectively, for the period 1953 to 1970 (USGS, 1975) at the Flippen gauging station. There is little dry-weather tributary flow between the dam and gauging station.

The Arkansas Water Quality Standards classify the White River from Bull Shoals Dam to Lock and Dam No. 3 as Use Class A and as a trout fishery. Bull Shoals Lake is Use Class AA and a warmwater fishery.

Use Class A is "Suitable for primary contact-recreation, propagating desirable species of fish, wildlife, and other aquatic life; a raw-water source for public water supplies; and other compatible uses." Use Class AA is the same as Class A but also "of extraordinary recreational and aesthetic value."

The Arkansas Department of Pollution Control and Ecology's water-quality monitoring system includes a station, WHI 47, just below Bull Shoals Dam on the White River (See Exhibit 14). This station has been regularly monitored for a wide range of physical, chemical, and bacterial parameters since April, 1974. The Corps of Engineers also conducts a monitoring program in the Lake area with stations just below and just above the dam (See Exhibit 15). The U.S. Geological Survey monitors several physical and chemical parameters on the lake above the dam.

The White River and Bull Shoals Lake water quality in the Lakeview area is generally very good and meets applicable water quality standards. Low-dissolved oxygen (DO) concentrations have been recorded below the dam a few times because de-oxygenated water was released from the lake's deep-water level.* Reoxygenation occurs rapidly, however, and the problem has not been severe (ADPC&E, 1976a,b).

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* The minimum dissolved oxygen standard for trout streams is 6.0 mg/l, and temperatures should not exceed 68°F because of man-made causes.

STORET DATE 77/10/15

EXHIBIT 14

WATER QUALITY

WHITE RIVER BELOW BULL SHOALS DAM

/TYPA/AMBNT/STREAM

PARAMETER				NUMBER	MEAN	VARIANCE	STAN DEV	COEF VAR	STAND ER	MAXIMUM	MINIMUM	BEG DATE	END DATE
00010	WATER	TEMP	CENT	40	11.0750	12.8605	3.58337	.323555	.566581	18.0000	.000000	74/04/10	77/08/09
00020	AIR	TEMP	CENT	41	16.9268	82.3199	9.07303	.536015	1.41697	31.0000	1.30000	74/04/10	77/08/09
00061	STREAM	FLOW,	INST-CFS	26	12407.7	.599E+08	7741.43	.623922	1518.22	26900.0	50.0000	74/04/10	76/09/21
00070	TURB	JKSN	JTU	36	2.82222	17.0881	4.13377	1.46472	.688962	25.0000	.600000	74/04/10	77/03/21
00076	TURB	TRBIDMTR	HACH FTU	5	1.62000	.657001	.810556	.570814	.362492	2.40000	.690000	77/04/20	77/08/09
00080	COLOR	PT-CO	UNITS	41	3.90244	11.8903	3.44822	.883608	.538522	10.0000	.000000	74/04/10	77/08/09
00095	CNDUCTVY	AT 25C	MICROMHO	41	241.634	255.825	15.9945	.066193	2.49793	277.000	207.000	74/04/10	77/08/09
00145	INVALID	PAR	NUMBER	1	27.0000					27.0000	27.0000	77/06/15	77/06/15
00300	DO		MG/L	41	8.69899	6.44780	2.53925	.291902	.396565	12.3000	3.10000	74/04/10	77/08/09
00301	DO	SATUR	PERCENT	40	78.4750	420.309	20.5016	.261248	3.24156	113.000	30.0000	74/04/10	77/08/09
00310	BOD	5 DAY	MG/L	40	1.36574	.749449	.865707	.643292	.136880	4.10000	.150000	74/04/10	77/08/09
00340	COD	HI LEVEL	MG/L	1	4.50000					4.50000	4.50000	76/07/20	76/07/20
00400	PH		SU	41	7.93997	.033565	.183153	.023067	.028604	8.27000	7.38000	74/04/10	77/08/09
00410	T ALK	CACO3	MG/L	1	122.000					122.000	122.000	77/06/15	77/06/15
00440	HCO3 ION	HCO3	MG/L	12	165.417	21.5454	4.64171	.031411	1.33996	151.000	137.000	74/04/10	77/03/21
00445	CO3 ION	CO3	MG/L	4	.000000	.000000	.000000		.000000	.000000	.000000	74/04/10	77/03/21
00500	RESIDUE	TOTAL	MG/L	35	146.686	83.5129	9.13854	.062305	1.54469	167.000	126.000	74/04/10	77/01/17
00515	RESIDUE	DISS-105	C MG/L	62	162.619	96.2088	9.80861	.068775	1.51350	163.000	113.000	74/04/10	77/08/09
00530	RESIDUE	TOT NFLT	MG/L	34	4.33333	16.0175	4.00219	.923583	.680986	18.0000	.000000	74/04/10	77/08/09
00610	NH3-N	TOTAL	MG/L	5	.078000	.002270	.047645	.610828	.021307	.130000	.010000	77/03/21	77/07/18
00615	NO2-N	TOTAL	MG/L	5	.054000	.002040	.045056	.834362	.020149	.100000	.010000	77/03/21	77/07/18
00620	NO3-N	TOTAL	MG/L	40	.420764	.104866	.323827	.764665	.051202	1.86000	.130000	74/04/10	77/07/18
00630	NO2&NO3	N-TOTAL	MG/L	3	.180000	.000700	.026458	.146084	.015276	.200000	.150000	77/05/18	77/07/18
00665	PHOS-TOT		MG/L P	40	.016250	.000424	.020592	1.26721	.003256	.100000	.010000	74/04/10	77/07/18
00900	TOT HARD	CACO3	MG/L	12	126.833	289.795	17.0236	.134218	4.91422	172.000	116.000	74/04/10	77/03/21
00910	CALCIUM	CACO3	MG/L	12	87.5000	153.545	12.3913	.141615	3.57707	118.000	76.0000	74/04/10	77/03/21
00915	CALCIUM	CA,DISS	MG/L	11	34.6909	26.2531	5.12378	.147698	1.54488	47.0000	30.0000	74/04/10	77/03/21
00916	CALCIUM	CA-TOT	MG/L	1	43.0000					43.0000	43.0000	77/06/15	77/06/15
00925	MGNSIUM	MG,DISS	MG/L	12	9.35833	3.37724	1.83773	.196373	.530506	13.0000	7.30000	74/04/10	77/03/21
00927	MGNSIUM	MG,TOT	MG/L	1	11.0000					11.0000	11.0000	77/06/15	77/06/15
00929	SODIUM	NA,TOT	MG/L	12	2.22500	.309332	.556176	.249967	.160554	3.20000	1.10000	74/04/10	77/06/15
00937	PTSSIUM	K,TOT	MG/L	11	1.35454	.312727	.559220	.412847	.168611	3.00000	1.00000	74/04/10	77/06/15
00940	CHLORIDE	CL	MG/L	32	5.36062	1.51146	1.22957	.228094	.217360	10.5300	4.00000	74/04/10	77/08/09
00945	SULFATE	SO4-TOT	MG/L	31	4.19355	3.16129	1.77800	.423985	.319339	8.00000	1.30000	74/04/10	77/07/18
01002	ARSENIC	AS,TOT	UG/L	21	3.71443	16.1132	4.01412	1.08068	.875953	21.0000	.003000	74/04/10	76/10/13
01027	CADMIUM	CD,TOT	UG/L	23	2.95652	13.2253	3.63666	1.23005	.758296	14.0000	.000000	74/04/10	77/06/15
01034	CHROMIUM	CR,TOT	UG/L	21	.857143	1.92857	1.38873	1.62018	.303046	3.00000	.000000	74/04/10	77/06/15
01042	COPPER	CU,TOT	UG/L	21	4.57143	37.5571	6.12839	1.34058	1.33732	21.0000	.000000	74/04/10	77/06/15
01045	IRON	FE,TOT	UG/L	21	38.5238	1227.56	35.0366	.909474	7.64561	134.000	.000000	74/04/10	77/03/21

STORET DATE 77/10/15

EXHIBIT 14 (Cont.)

WATER QUALITY

/TYPA/AMBNT/STREAM

WHITE RIVER BELOW BULL SHOALS DAM

PARAMETER				NUMBER	MEAN	VARIANCE	STAN DEV	COEF VAR	STAND ER	MAXIMUM	MINIMUM	BEG DATE	END DATE
01051	LEAD	PB,TOT	UG/L	22	7.50000	88.8333	9.42514	1.25669	2.00945	35.0000	.000000	74/04/10	77/06/15
01055	MANGNESE	MN	UG/L	22	52.7273	3378.40	58.1240	1.10235	12.3921	237.000	.000000	74/04/10	77/06/15
01092	ZINC	ZN,TOT	UG/L	21	2.00000	13.4000	3.66060	1.83030	.798808	16.0000	.000000	74/04/10	77/06/15
31501	TOT COLI	MFIMENDO	/100ML	35	102.543	35197.2	187.609	1.82957	31.7117	900.000	4.00000	74/04/10	77/08/09
31616	FEC COLI	MFM-FCBR	/100ML	39	71.4102	92078.6	303.445	4.24931	48.5900	1880.00	4.00000	74/04/10	77/08/09
31679	FECSTREP	MF M-ENT	/100ML	20	44.1500	5473.71	73.9845	1.67575	16.5436	212.000	4.00000	74/10/21	77/01/17
39161	LASSO	(ALCHLR)	UG/L	3	.003333	.000001	.001155	.346410	.000667	.006000	.002000	75/11/18	77/06/15
39330	ALDRIN	WHL SMPL	UG/L	8	.001000	.220E-11	.000001	.001486	.525E-06	.001000	.001000	74/07/31	77/06/15
39337	A-BHC	WHL SAMP	UG/L	1	.001000					.001000	.001000	77/07/18	77/07/18
39360	DDD	WHL SMPL	UG/L	5	.001400	.800E-06	.000894	.638890	.000400	.003000	.001000	74/07/31	75/03/31
39365	DDE	WHL SMPL	UG/L	8	.001000	.220E-11	.000001	.001486	.525E-06	.001000	.001000	74/07/31	77/06/15
39370	DDT	WHL SMPL	UG/L	10	.002100	.000003	.001595	.759588	.0[illegible]504	.006000	.001000	74/07/31	77/08/09
39380	DIELDRIN	WHL SMPL	UG/L	8	.001000	.220E-11	.000001	.001486	.5[illegible]-06	.001000	.001000	74/07/31	77/06/15
39388	ENDOSULN	WHL SMPL	UG/L	5	.001000	.272E-11	.000002	.001652	.738E-06	.001000	.001000	74/07/31	75/03/31
39390	ENDRIN	WHL SMPL	UG/L	10	.002000	.000002	.001414	.707107	.000447	.005000	.001000	74/07/31	77/08/09
39400	TOXPHENE	WHL SMPL	UG/L	10	.084600	.000895	.029912	.353568	.009459	.110000	.050000	74/07/31	77/08/09
39410	HCHLR	WHL SMPL	UG/L	5	.001000	.272E-11	.000002	.001652	.738E-06	.001000	.001000	74/07/31	75/03/31
39420	HCHLR-EP	WHL SMPL	UG/L	5	.001000	.272E-11	.000002	.001652	.738E-06	.001000	.001000	74/07/31	75/03/31
39480	MTHXYCLR	WHL SMPL	UG/L	5	.004600	.000006	.002510	.545649	.001122	.009000	.003000	74/07/31	75/03/31
39600	MPARATHN	WHL SMPL	UG/L	10	.005800	.000006	.002530	.436174	.000800	.010000	.001000	74/07/31	77/08/09
39782	LINDANE	WHL SMPL	UG/L	10	.001000	.293E-11	.000002	.001712	.541E-06	.001000	.001000	74/07/31	77/08/09
60620	INERT	SHELLS	PNATE/ML	1	.420000					.420000	.420000	74/12/16	74/12/16
60915	INVALID	PAR	NUMBER	1	38.0000					38.0000	38.0000	75/03/31	75/03/31
71900	MERCURY	HG,TOTAL	UG/L	1	.500000					.500000	.500000	76/10/13	76/10/13

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EXHIBIT 15
WATER QUALITY
(CORPS OF ENGINEERS MONITORING)

Period from July 1973-August 1977

PARAMETER	WHITE RIVER 500 FT. BELOW DAM		BULL SHOALS LAKE NEAR DAM - 25 FT. DEPTH		BULL SHOALS LAKE NEAR DAM - 100 FT. DEPTH	
	MEAN	RANGE	MEAN	RANGE	MEAN	RANGE
WATER TEMP. (°F.)	54	46-65	68	53-82	56	46-66
pH	7.3	6.2-8.2	7.2	6.3-7.9	6.8	6.5-7.8
SP. CONDUCTANCE (UMHOS)	183	< 50-230	224	190-265	245	150-440
SECCHI DISK (FT)	-	-	24	15-35	23	18-35
DISS. OZ (mg/l)	7.9	5.0-12.4	9.6	6.7-12.8	5.7	0.0-10.5
COLOR	4	0-20	4	0-20	5	0-15
TURBITY (jtu)	3	0-10	2	0-5	3	0-6
ALKALINITY (mg/l)	128	116-160	119	103-145	126	92-176
TOT. HARDNESS (mg/l)	141	120-196	124	117-132	131	118-154
Ca HARDNESS (mg/l)	92	72-116	80	64-105	88	70-112
$NO_3 + NO_2$ (mg/l)	0.27	0.17-0.35	0.09	0.01-0.25	0.25	0.15-0.35
NH_4 (mg/l)	0.02	0.00-0.04	0.03	0.00-0.07	0.02	0.00-0.05
KJELDAHL N (mg/l)	0.17	0.02-0.39	0.25	0.13-0.35	0.24	0.13-0.30
TOTAL PO_4 (mg/l)	0.01	0.00-0.02	0.04	0.01-0.11	0.01	0.00-0.02
ORTHO PO_4 (mg/l)	0.01	0.00-0.02	0.02	0.01-0.04	0.005	0.00-0.02
CHLORIDE (mg/l)	4.7	2.8-7.0	3.8	3.3-5.1	3.4	2.7-3.8
SULFATE (mg/l)	6.8	5.3-8.7	6.7	5.1-8.1	6.5	4.7-10.0
ALUMINUM (mg/l)	0.06	0.04-0.12	0.06	0.04-0.07	0.08	0.04-0.12
ARSENIC (mg/l)	0.00	0.00-0.01	0.00	0.00-0.01	0.01	0.00-0.04
CHROMIUM (mg/l)	0.00	0.00-0.01	0.00	0.00-0.02	0.00	0.00-0.01
COPPER (mg/l)	0.10	0.01-0.21	0.13	0.01-0.27	0.09	0.01-0.22
LEAD (mg/l)	<0.10	<0.10	<0.1	< 0.1-0.2	0.2	< 0.1-0.8
MANGANESE (mg/l)	0.04	0.00-0.12	0.03	0.00-0.03	0.03	0.01-0.06
MERCURY (ug/l)	0.02	0.00-0.18	0.0	0.0-0.0	0.0	0.0
NICKEL (mg/l)	<0.05	<0.05	<0.05	<0.05-0.05	<0.05	<0.05-0.05
POTASSIUM (mg/l)	1.5	1.2-1.9	1.4	1.3-1.6	1.7	1.3-2.3
ZINC (mg/l)	0.10	0.03-0.22	0.14	0.04-0.27	0.13	0.05-0.24
IRON (mg/l)	0.05	0.01-0.13	0.03	0.00-0.07	0.05	0.02-0.09
BOD (mg/l)	0.8	0.2-1.4	1.1	0.6-2.2	1.1	0.6-2.3
FECAL COLIFORM/100ml	0.6	0-2	2	0-7	-	-

< Less than

Cold water releases from Bull Shoals Dam have greatly altered the temperature and related fisheries characteristics of the river. Whether this alteration constitutes water quality degradation is problematical since the artificially sustained trout fisheries are extremely popular.

5.2.2 Ground Water Setting

The bedrock beneath the site area down to the Precambrian basement contains both major and minor aquifers. The surficial Cotter-Jefferson City dolomite formation is considered a minor aquifer. Fractures in the 350-ft-thick formation yield flows on the order of 10 to 15 gpm. This is suitable for domestic and farm wells, but the shallow depth makes them susceptible to pollution. Most of the domestic wells in the area are in this formation.

The underlying Roubidoux formation, consisting of a sandstone with interbedded cherty dolomite, is a major aquifer yielding up to 350 gpm. The 800-ft-deep wells in the Lakeview area obtain their water from this aquifer.

The dolomitic Van Buren formation and its basal member, the Gunter Sandstone, lie beneath the Roubidoux and are considered a major aquifer. The yields are on the order of 50 to 75 gpm, but higher yields have been reported. Wells in the Gunter formation are on the order of 1100 ft deep in this area.

The overburden materials in the Lakeview area consist of residual materials produced by the weathering of dolomite and limestone bedrock. The upper part of the bedrock is typically jointed, and solution and weathering have produced a fractured zone. The depth of major fractures and whether hydraulic connections exist between the Cotter-Jefferson City formation and the underlying Roubidoux aquifer have not been defined.

Groundwater generally lies at about 110-ft depth in the Lakeview plateau area. At the site, streams act as both recharge and discharge features depending upon the duration and intensity of rainfall and the degree of soil moisture at the time of the event. The water levels may be lowered and a cone of depression formed in the vicinity of each pumping well. However, the aquifers have sufficient water so drawdown will be limited to the immediate vicinity of the pumping well without affecting the regional water table.

Porosity and permeability in carbonate rock are due to solution of the rock. The permeability of limestone is also due to joints and bedding planes. In this area the recharge and ground water flow are considered rapid and the water may travel long distances underground. Pollution can be a problem because of the fractures, since large volumes of pollution could enter and travel rapidly through the groundwater system.

5.2.3 Effects of Construction on Hydrologic Elements

Some soil will enter the local surface waters because of erosion during construction. Even with heavy rainfall during the time of excavation, the localized short-term adverse effect of turbidity and sedimentation in Bull Shoals Lake and the White River will be minimal because of the small amount of excavation open at a time and the relatively large size of the water bodies involved.

Improper installation of sewer lines could disrupt or contaminate the public water supply system. In accordance with Arkansas Department of Public Health regulations, water main location maps will be used to avoid main breakage and sanitary sewers and water mains will be kept as far apart as practicable. Water mains which are necessarily close to sewers will be at least 18 inches above the top of the sewer line.

5.2.4 Effects of Operation on Hydrologic Elements

Potentially unfavorable long-term impacts include the effects of the point-source discharge to the White River; sludge generation and disposal problems; contamination from sewer line leakage; the fact that some development in the area with existing or potential on-site disposal problems will not be served; and the loss of groundwater recharge, soil moisture, and plant nutrients from on-site disposal systems.

Primary long-term water-quality benefits will be protecting and improving ground water quality and assuring that future degradation of surface waters, as well as ground water from nonpoint septic tank sources, will be largely eliminated in the Lakeview area. The project will help to maintain the valuable and high-quality water resources of Bull Shoals Lake and the White River.

The Lakeview discharge will have negligible water quality impact on the White River. The target load assimilative capacity for the reach of the White River from Bull Shoals Dam to Crooked Creek (27.2 miles downstream) is 11,126 lb BOD/day (Arkansas Department of Pollution Control and Ecology, 1976b). The design Lakeview discharge at the 5 mg/l effluent limit will contribute 12.5 lb/day. The fecal coliform effluent standard of 200 per 100 ml is essentially the same as the Class A and AA stream standard. With this high effluent quality and a low flow dilution factor of more than 230 to 1, there will be no significant increase in fecal coliform concentration. The increase in stream temperature from the discharge, assuming the maximum wastewater flow at 95°F and low flow stream conditions with a temperature of 65°F will be 0.2°F. The suspended solids discharge of 15 mg/l will cause no measurable increase in turbidity of the White River.

The effects on surface-water quality are prevention of contamination from degraded ground water inflow, and effluent surfacing and runoff from malfunctioning septic tank systems. Because most development in Lakeview is near and/or drains toward Bull Shoals Lake, the project will benefit the lake more than the White River. Since there is no current evidence of significant degradation of Bull Shoals Lake in the Lakeview area, these benefits will be largely preventive. A substantial long-term benefit will be eliminating unsanitary conditions caused by effluent-surfacing from overloaded or malfunctioning on-site disposal systems. The project will also eliminate the suspected practice of spreading septage (sludge pumped from septic tanks) on fields rather than proper disposal at a wastewater treatment plant.

The loss of ground water recharge will be insignificant. Depletion of the Cotter-Jefferson City formation has not been a problem since the area has plentiful ground water recharge and modest withdrawals. The beneficial effects on water quality far outweigh any recharge losses.

The project will pose no health or other problems for downstream water supplies in view of the 70-mile distance to the nearest downstream water system, the relatively small effluent flow, a large stream-dilution factor, the absence of industrial waste hazards, the existing high water-quality, and the advanced level of wastewater treatment.

5.2.5 Reliability Factors

The collection-and-treatment system reliability is important to assure full realization of the long-term benefits and prevent nuisance conditions from odors or sewage overflow. Proper operation and maintenance are essential. One and one-half man-years are allocated for operation and maintenance of the Lakeview system, which is a reasonable level according to experience with other communities and the judgment of a representative of the State Department of Pollution Control and Ecology. The Town of Flippen uses one and one-half man-years for a system of similar size, and two man-years are allotted for the planned Bull Shoals system, which will have seven more pump stations, nearly twice the design treatment capacity, and a treatment process likely to require closer operational monitoring and control.

The proposed treatment process should provide good overall stability and resistance to upset. It is relatively simple to operate. The large wastewater flow fluctuations associated with seasonal tourist activities should pose no undue problems. Since there are no industrial discharges, the possibility of acute problems from toxic wastes is small. Adoption and enforcement of a proper sewer use-ordinance will help to insure that unauthorized connections and problem wastes do not damage treatment facilities or compromise efficiency.

Stand-by power generators and a dual oxygen transfer system will be provided at the treatment plant. Individual treatment units can be removed from service for maintenance or repair without serious loss of treatment plant capacity and effectiveness.

Several 8- and 10-inch gravity collection lines are planned to closely follow the shoreline of Bull Shoals Lake. Much of this lakeshore area is rather steep with shallow, fractured rock, and is close to heavily-used water contact-recreation areas. Sewer-line leakage in these rocky areas can result in nearly direct seepage into the lake, causing pollution and possible health risks.

To prevent ground- and surface-water pollution near the proposed treatment plant, leaching from the lagoons and sludge disposal sites will be prevented by an added plastic or bentonite clay lining. The cost of such lining is included in the estimated project costs. An under-drain system to collect leachate and carry it back to the plant for treatment will also be installed.

5.3 BIOLOGY

5.3.1 Terrestrial Setting

Upland hardwoods and bottom land forests characterize the general vegetation, with the specific type depending on the immediate soil conditions, the amount of sunlight, and past fire control. The prominent vegetation types and their associated faunal components at the proposed Lakeview site are discussed below and shown in Exhibit 16.

The Red Oak-White Oak-Shagbark Hickory-type is found on the best sites in both the uplands and lowlands. It is the climax-type of the oak-hickory forest region. The common reptiles in the forest include the northern fence lizard, five-lined skink, prairie ringneck snake, black rat snake, northern copperhead, and timber rattlesnake. Common mammals include the eastern mole, cottontail rabbit, white-footed mouse, raccoon, grey fox, and white-tailed deer. Commonly observed woodland breeding bird species include turkey vultures; red-tailed hawks; mourning doves; yellow-billed cuckoos; yellow-shafted flickers; red bellied, red-headed, and downy woodpeckers; eastern wood pewees; bluejays; crows; black-capped chickadees; tufted titmice; white-breasted nuthatches; robins; summer tanagers; and cardinals.

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TABLE OF CONTENTS

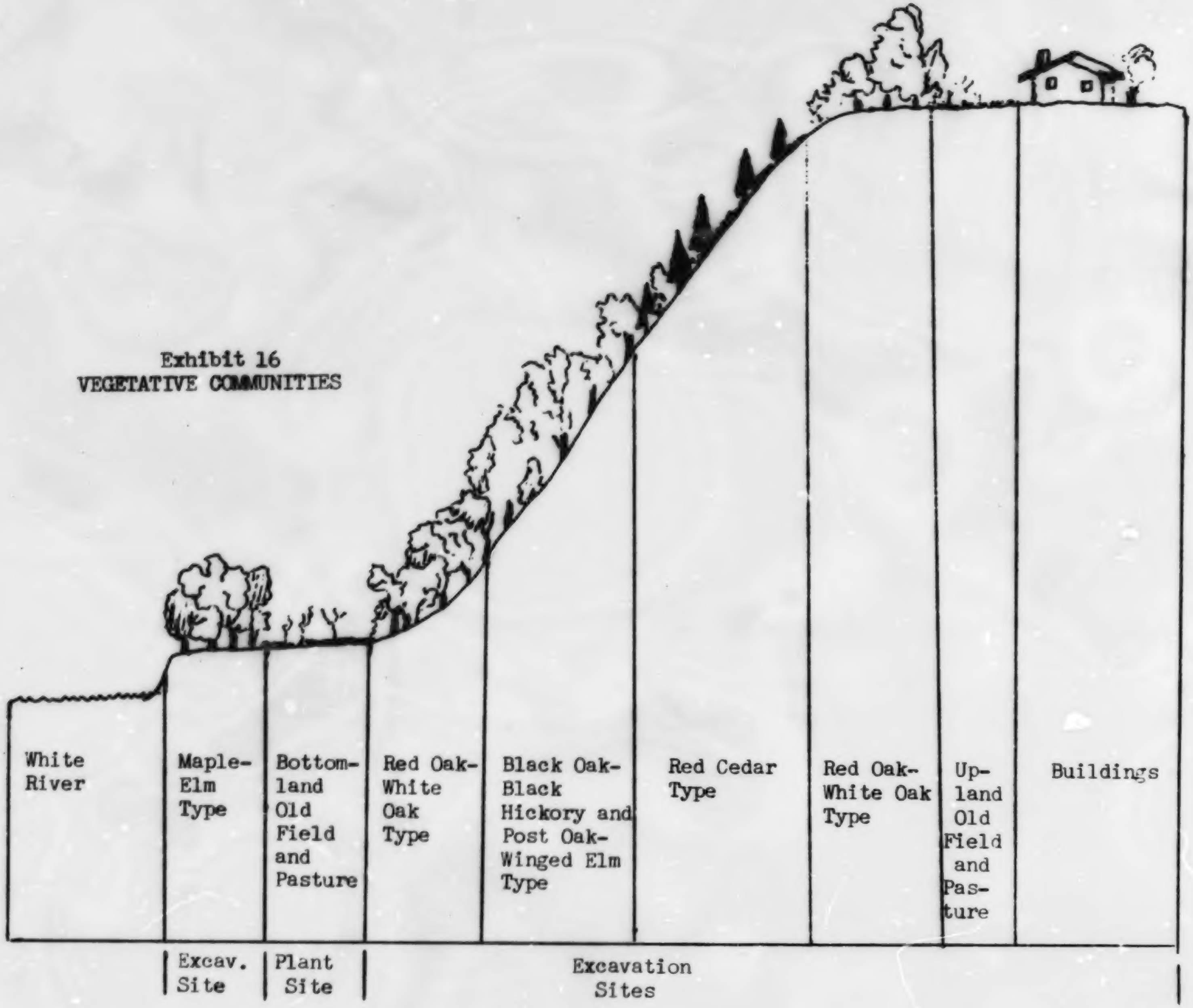
Section	Page	
EXECUTIVE SUMMARY	i	1/A6
A. Problems and Issues	i	1/A6
B. Environmental Setting	i	1/A6
C. Alternatives Evaluated	iv	1/A9
D. Proposed Project and Impacts	vi	1/A11
E. Comments Requested	viii	1/A13
F. Draft EIS to EPA	viii	1/A13
1. INTRODUCTION	1	1/B4
1.1 Background	1	1/B4
1.2 Issues	2	1/B5
1.3 Federal Policy	3	1/B6
2. PROBLEMS	5	1/B8
2.1 On-Site Systems	5	1/B8
2 2 Water Quality and Public Health	7	1/C7
2.3 Growth and Associated Wastewater Problems	10	1/D2
3. ALTERNATIVES	12	1/D4
3.1 No Action	12	1/D4
3.2 Upgrading On-Site Systems	14	1/D6
3.3 Regional Wastewater System or Connection to Bull Shoals Plant	23	1/E5
3.4 Municipal Wastewater System Design Alternatives	25	1/E8
3.5 Alternatives Available to EPA	30	1/E13
4. DESCRIPTION OF THE PROPOSED PROJECT	32	1/F3
4.1 Treatment System	32	1/F3
4.2 Collection System	33	1/F6
4.3 Land and Operation and Maintenance Requirements	33	1/F6
4.4 Construction Schedule	34	1/F10
4.5 Costs	34	1/F10

Section		Page	
5.	ENVIRONMENTAL IMPACTS OF THE PROPOSED PROJECT	36	1/F14
5.1	Geology, Soils, and Topography	36	1/F14
5.1.1	Effects of Construction on Geology, Soils, and Topography	36	1/F14
5.1.2	Effects of Operation on Geology, Soils, and Topography	36	1/F14
5.2	Hydrology	37	1/G1
5.2.1	Surface Water Setting	37	1/G1
5.2.2	Ground Water Setting	39	1/G8
5.2.3	Effects of Construction on Hydrologic Elements	40	1/G9
5.2.4	Effects of Operation on Hydrologic Elements	41	1/G10
5.2.5	Reliability Factors	42	1/G11
5.3	Biology	44	1/G13
5.3.1	Terrestrial Setting	44	1/G13
5.3.2	Aquatic Setting	45	2/A6
5.3.3	Effects of Construction on Fish and Wildlife	47	2/A8
5.3.4	Effects of Construction on Vegetation	48	2/A9
5.3.5	Effects of Operation on Fish and Wildlife	49	2/A10
5.4	Socio-Economics	52	2/A13
5.4.1	Socio-Economic Setting	52	2/A13
5.4.2	Effects of Construction on Socio-Economic Elements	55	2/B4
5.4.3	Effects of Operation on Socio-Economic Elements	57	2/B11
5.5	Air and Sound Quality	63	2/C4
5.5.1	Effects of Construction on Air and Sound Quality	63	2/C4
5.5.2	Effects of Operation on Air and Sound Quality	64	2/C5
5.6	Archeology and History	65	2/C6
5.6.1	Effects of Construction on Archeology and History	65	2/C6
5.6.2	Effects of Operation on Archeology and History	66	2/C7
6.	COORDINATION	67	2/C8
6.1	Coordination and Public Participation	67	2/C8
6.2	Correspondence	67	2/C8
6.3	Review Process and Preparation of Final EIS	68	2/C9

Literature Cited and Other References Consulted

Appendix A - Correspondence 2/D6

Exhibit 16
VEGETATIVE COMMUNITIES


White River
Maple-Elm Type
Bottom-land Old Field and Pasture
Red Oak-White Oak Type
Black Oak-Black Hickory and Post Oak-Winged Elm Type
Red Cedar Type
Red Oak-White Oak Type
Up-land Old Field and Pas-ture
Buildings
Excav. Site
Plant Site
Excavation Sites

The Black Oak-Black Hickory-type is found on dry east-facing and west-facing slopes intermediate in moisture and fertility between the Red Oak and Post Oak forests. The vertebrates in this forest are similar to those in the Red Oak forest. Tree squirrels and deer are most abundant in this forest.

The Post Oak-Blackjack Oak-Winged Elm-Black Hickory-type is found on dry south-facing slopes intermediate in moisture and fertility between the Black Oak and Red Cedar types. The vertebrates in this forest are similar to those in the Red Oak forest. These forests usually support fewer numbers of species because the poor soil fertility produces a smaller mast yield.

The Red Cedar-type is found on bluffs, bald knobs, rocky glades, and upland old fields. The cedars provide favorite food for wintering robins, bluebirds, cedar waxwings, and cardinals.

The Silver Maple-Birch-American Elm-Sycamore-Cottonwood-type occurs in the narrow and well-drained valleys of the floodplain that are not subject to prolonged submergence.

5.3.2 Aquatic Setting

a. Plankton

The fluctuating levels of the White River below Bull Shoals Dam have eliminated most aquatic macrophytes. Brown et al (1967) reported a total of 68 genera of phytoplankton comprising 99.9 percent of the net plankton collected in the Bull Shoals tailwater. The numerically dominant phyla were Chrysophyta and Cyanophyta, and diatoms comprised the majority of the Chrysophyta. Twenty-five genera of zooplankton were identified. Rotifers were the most abundant group of zooplankton and nauplii were the most commonly taken copepods. *Difflugia* was the most abundant protozoan, and *Bosmina* and

Daphnia were the most abundant cladocerans. The tailwater community of the White River is generally augmented by lake plankton just below the impoundment, but the lake plankton soon decrease under river conditions.

b. Benthic Macroinvertebrates

Bull Shoals tailwaters were abundant in the benthic macroinvertebrates, Amphipoda, Tendipedidae, Isopoda, and Oligochaeta (Brown, et al 1967). Several factors including large and frequent fluctuations in water level and cold-water temperatures throughout the year presumably restrict the benthic fauna to those organisms capable of withstanding these conditions.

c. Fish

The White River was once a productive sport and commercial warm-water fishery. Cold tailwaters resulting from completing Bull Shoals Dam killed the native fish and ruined the sport and commercial fisheries on a 100-mile stretch of the river. Careful planning and an intensive trout-stocking program by the Arkansas Game and Fish Department has created the largest and most productive put-and-take trout stream in the nation. The 750,000 trout that are annually stocked now comprise 99 percent of the gamefish in this section of the river. The trout are not self-sustaining since natural reproduction is retarded by stream flow fluctuation and is insufficient to support intense fishing pressures. While the stocked area extends for 100 miles, 75 percent of the trout are in the 50- or 60-mile stretch below the dam, and most of the trophy-size trout are caught in the first 20-mile stretch. An estimated 250,000 man-days of fishing in the area generated $25 million in revenues over a four-county region.

5.3.3 Effects of Construction on Fish and Wildlife

No threatened and endangered fish, amphibian, or reptile species are known to be found in the Lakeview area. Turbidity during construction will be temporary and minor and should be harmless to fish species.

The only endangered bird species in the Lakeview area is the Southern Bald Eagle (*Haliaeetus leucocephalus*) a winter transient. Eagles are known to feed below reservoirs on dead or stunned fish that have traveled through hydroelectric generators. The noise resulting from extensive blasting from construction may temporarily drive the eagle from the Lakeview area.

Both the Gray Bat (*Myotis grisescens*) and the Indiana Bat (*Myotis sodalis*) are endangered mammals which use the caves in north central Arkansas as winter hibernacula. While they do not use the large commercial or extensively altered caves in the Lakeview area (e.g., Bull Shoals caverns and Saltpeter Cave), they may use the smaller caves located high in the bluffs. Indiana and Gray bats are highly sensitive to disturbances resulting from man's activities; thus, a colony inhabiting a cave in the immediate area will be vulnerable to blasting during construction. The most serious condition will be if blasting coincides with hibernation periods (late October to late March). Such disturbances will arouse the bats, causing them to rapidly metabolize their limited stores of fat reserves and make them susceptive to disease or hinder their success in surviving the winter (Harvey, 1976). Blasting in the winter months will have an adverse impact on bat colonies if present in the area. Blasting during the summer months will adversely affect the cave-dwelling maternity colonies of the Gray Bat, which will probably move to other caves if disturbed. The Indiana Bat, whose nurseries are more arboreal in nature, will not be adversely affected.

There will be minor adverse short-term effects involving the local small vertebrate species populations during construction activities. This will result from loss of habitat, forcing them to suffer from the limited carrying capacity of the surrounding area.

5.3.4 Effects of Construction on Vegetation

Excavation for the approximately 22 miles of collection system will adversely affect about 10 acres of mixed upland and lowland forest types and areas already disturbed by development. Since most of the collection system will parallel existing roads, vegetative damage will be reduced. The contractor will be cautioned against excessive injury to vegetation, and construction inspection should further insure that injury is not excessive. Most vegetational/habitat losses that will occur are primary short-term adverse impacts that cannot be avoided and constitute an irretrievable commitment of resources. Some of the large trees can be salvaged for firewood or lumber while branches and roots can be chipped for mulch. The natural grasses and herbs are expected to quickly reestablish themselves along the sewer lines.

The proposed treatment plant will eliminate about eight acres of bottomland pasture. Mitigative measures will include landscaping to blend with the surrounding natural environment and programs to restore grassy vegetation at the construction site.

The only endangered plant known to be found in the Lakeview vicinity is an oak tree, the Ozark Chinquapin (*Castana ozarkensis*) which appears on the Federal endangered species list. Since this species has not been observed in the project area and has a scattered distribution throughout southwest Missouri and northwest Arkansas, it will not be adversely affected by the project. No existing or potential natural area sites under the Arkansas Environmental Preservation Commission are near the proposed project.

Construction-related soil erosion and resultant localized turbidity will result in very minor adverse short-term impacts on aquatic plant species because light penetration and the photosynthetic zone are reduced.

5.3.5 Effects of Operation on Fish and Wildlife

Operation of the proposed project should not cause any adverse impacts on wildlife species. Water-quality considerations are of paramount importance because of the extensive and economically important recreational and commercial fishery.

Chlorination is an effective and economical way to disinfect sewage. However, chlorine is an extremely strong biocide and may result in long-term damage to aquatic life. A 2 mg/l effluent residual would result in a stream concentration of approximately 0.01 mg/l at low-flow (110+ cfs) and maximum effluent discharge (0.69 cfs). Studies show this value is near or within the lethal range for the brown and rainbow trout which inhabit the tailwaters below Bull Shoals Dam (Merkens 1958; Mich. Dept. Nat. Res. 1971).

The EPA Task Force Report (1976a) indicates that chlorine concentrations below 0.002 mg/l have no adverse effect on cold-water fish such as trout. Their recommendations indicate residual chlorine in the receiving waters should not exceed 0.002 mg/l. In the light of the information presented against chlorinated discharges, the Arkansas Department of Pollution Control and Ecology has required dechlorination before discharging treated wastewaters from the proposed project. (See Appendix A).

Several studies evaluated the effects of various dechlorination methods on the toxicity of chlorinated wastes. Arthur et al (1975) reported chlorine toxicity was greatly reduced or eliminated by using sodium thiosulfate, sodium biosulfate, and sulfur dioxide. Studies published by Martens et al (1974) and Nebel et al (1973) state they observed no acute salmon mortality in undiluted effluent after dechlorination by storage in a lagoon. Dechlorinated effluent should not adversely affect the trout population as a whole; the trout, however, may shun the area around the sewage outfall which will be located on the river bank.

Attempts to mitigate the enrichment effect by using other dilution principles such as midstream and multiple-outlet systems may prove to be less effective. These two outfall types produce a quick mixing of sewage and stream water which forms a zone of concentrated sewage across a stream, causing heavy fish depletion and an ecological barrier adversely affecting both fish movement and migration. In contrast, the bank outfall better dilutes and more naturally purifies the effluent by taking a longer time to more efficiently mix the effluent with water across the stream. From the viewpoint of fish protection, the simple bank outfall is more effective than the other, more complicated types (Tsai, 1973).

Trout, a representative species of Salmonidae, have the lowest thermal tolerance of fresh-water fishes. Their maximum upper lethal temperature is barely over 25°C (77°F) (Brett, 1956, and Fry et al., 1946), and lethargy is apparent at 21°F (70°F) (Baker and Keith, oral communication) and may potentially lead trout to physiological stress.

The project's thermal impact on the White River will be affected by the fluctuating maximum and minimum discharges caused by hydroelectric generation at Bull Shoals Dam. The most critical period will be during minimum generation in the summer when the 110+ cfs low flow will be mixed with the maximum wastewater plant effluent of 0.69 cfs from the aerated lagoons which have been heated by high ambient temperatures.

Arkansas Game and Fish Commission temperature data indicate there were several days during the summer of 1977 when water temperatures were 72°F or higher during the daylight hours at Cotter Station (20 river miles below Bull Shoals Dam). Adding treatment plant effluent and the resultant slight temperature increase at these times can be detrimental to the trout program (Keith, see letter from the Arkansas Game and Fish Commission). "Detrimental" does not necessarily imply death for the trout, but rather a potential stress situation in which the fish may avoid this stretch of the river in preference for waters in keeping with temperatures of their normal habitat. By far the overriding factor, however, will be the amount, schedule, and temperature of the releases from Bull Shoals Dam.

Another associated thermal effect involves a potential thermal plume resulting from the proposed single discharge-point for the treatment plant. A condition may arise that could limit the normal movements of the trout within the tailwaters or create a temporary barrier during minimal periods of generation. As was stated previously, any attempted mitigative measure involving different outfall types may result in a more serious consequence.

In summary, while the trout may avoid the outfall site during low-flow periods, the Lakeview discharge will have a minimal adverse effect on trout and other aquatic species of the White River. The communities of Cotter and Bull Shoals, however, have also recently planned or built wastewater treatment plants designed to discharge into the White River and to meet similar stringent discharge requirements. Careful monitoring and compliance with discharge requirements will minimize potential cumulative effects.

5.4 SOCIO-ECONOMICS

5.4.1 Socio-Economic Setting

Lakeview, Arkansas is a small and relatively young community on the south shore of Bull Shoals Lake just southeast of the dam and the community of Bull Shoals. Incorporated in 1973, its city limits form a linear pattern on either side of Arkansas Highway 178, and adjoin several unincorporated residential and recreational developments to its north, east, and west. Bull Shoals State Park, the Lakeview Recreational-Use Area, Edgewood Bay, and Leisure Hills further extend the pattern of development along this particular highway facility.

The Lakeview service area is best characterized as a recreation and retirement community with a population which is principally interested in the benefits of its lakeside location. A local resident survey shows the majority has lived in the community for less than 10 years and moved from some other state. About 85 percent of its population is above high school age, many are retired, and most own their own homes. Tourist and recreation-oriented businesses are the major employers. Fourteen motels have a total of 155 units, and restaurants, service stations, and a principal retail shopping area complete the business district. The resident labor force is about 29 percent of the community population, and nearly half work within the city limits. The derived family income for 60 percent of the residents is over $8,000 a year (Lakeview Planning Commission, 1977).

Edgewood Bay is a residential development of about 85 single-family homes, and Leisure Hills South is a residential development of about 60 single-family and duplex units. Both adjoin Lakeview on the northeast.

Bull Shoals State Park, with facilities for boating, camping, lodging, picnicking, and swimming, is operated by the Arkansas Department of Parks and Tourism. It has a central sewer system with a small treatment plant.

The Lakeview Recreation Area is one of 21 public-use areas on Bull Shoals Lake operated by the United States Army Corps of Engineers and has facilities for camping, boating, fishing, swimming, picnicking, etc.

The proposed project is not covered in a Regional, Basin, or Areawide Plan. The Northwest Arkansas Economic Development District, Inc. has prepared a Comprehensive Development Plan for the City of Lakeview which was adopted in final form on March 14, 1977 (Ordinance No. 4). The approved plan includes objectives and policies to provide a sanitary sewer system to protect the environment from pollution by inadequate septic tank systems.

a. Population

Lakeview's population in the 1975 special census year was 450 and the current adjusted 1977 figure is 530. The town has been in existence for only a short time but a study of existing and potential trends has been made. The current and projected population levels for the project areas are shown in Exhibit 17. The figures shown are based on an analysis of population trends of Lakeview and the surrounding

EXHIBIT 17

LAKEVIEW, ARKANSAS
POPULATION DATA
LAKEVIEW WASTEWATER SYSTEM

	1975	1977	1980	1985	1990	1995
Town of Lakeview	450	530	625	865	1200	1675
Lakeview Public-Use Area (Population Equivalent)	160	195	230	230	230	230
Bull Shoals State Park (Population Equivalent)	250	250	250	500	500	500
Areas Outside of Town Limits	300	375	425	500	550	600
Edgewood Bay (2.0 per HH)		(170)				(305)
Leisure Hills (1.83 per HH)		(110)				(200)
Riverside Trailer Park (1.85 per HH)		(25)				(25)
Other		(70)				(70)
TOTALS:	1160	1350	1530	2095	2480	3000

Notes: (1) 1975 census figures for Town of Lakeview from special census. The 1977 population figure was computed by the following formula: 1975 special-census population (450) by number of 1975 dwelling units (180) = number of persons per household (HH) (2.50). 1975 person per HH 2.50) x number of 1977 dwelling (units (212) = 1977 population (530).

(2) 1980, 1985, 1990, 1995 projection and based on a straight-line method using a calculated 38.6% increase for 5-year period.

(3) 1975 estimate for area outside town limits based on house count. 1980, 1985, and 1995 projections for the residential developments outside the town limits based on expected 100% growth in 20-year period.

(4) Lakeview public-use area figures are based on information provided by the Little Rock District, U.S. Army Corps of Engineers.

(5) Bull Shoals State Park figures are based on information provided by Arkansas Department of Parks and Tourism.

communities (see Exhibit 18). The population increases between 1970 and the special census year range from +10.6 percent for Cotter to +181.3 percent for Lakeview's neighbor, Bull Shoals.

Regardless of the project, the Lakeview community (including areas outside the town limits) is expected to have a large increase in population of about 1,650 people between 1977 and 1995, the design period. This growth to 3,000 will parallel the recent growth of Bull Shoals and other communities in the region. Transient population using the Lakeview public-use area and the State Park are accounted for by using a "population-equivalent" of 730 persons, so 2,270 people will actually be year-round residents. The 1977-1995 projections are based on a straight-line percentage of 38.6 percent for each 5-year period. This percentage was derived from the 17.7 percent increase occurring between the 1975 special-census and the 1977 population update, and further projecting a 17.7 percent increase and 1980 population of 624. The difference between the 1975 population (450) and the projected 1980 population (624) is 174 for a 38.6 percent increase.

Some of the factors supporting this future-growth projection are: Lakeview and the surrounding area have grown rapidly because of mild climate and low tax rates; the location of Bull Shoals Lake combined with attractive residential development; the scenic and quiet atmosphere which makes it attractive for retired persons; and Bull Shoals State Park, Bull Shoals Lake, the White River, and the natural beauty of the physical environment offer a wide range of recreational opportunities.

Bull Shoals Lake was built in 1951 and filled in 1952. Fish productivity for this kind of lake generally peaks

EXHIBIT 18

POPULATION TRENDS OF SURROUNDING TOWNS

Town	1950	1960	1950-60 % Chg.	1970	1960-70 % Chg.	Special-Census Year	Population	1970-Census-Year Change % Change
Bull Shoals	-	268	-	430	+ 60.4	(1975)*	1,210	+181.3
Cotter	1,089	683	-37.2	858	+ 25.6	(1976)	949	+ 10.6
Flippin	646	433	-32.9	626	+ 44.5	(1975)	1,026	+ 63.8
Gassville	273	233	-14.6	434	+ 86.2	(1972)	673	+ 55.0
Mountain Home	2,217	2,105	- 5.0	3,936	+ 86.9	(1976)	6,415	+ 62.9
Lakeview	-	-	-	-	-	(1975)	450	-

* Recognized Town Estimate (Source: Proposed Sanitary Sewage Improvements, City of Bull Shoals, Arkansas. E.P.A. Grant No. 6-05-0395-01-0, Step 1, Facility Plan and Environmental Assessment, May 1975, Rogers and Associates, Inc., Consulting Engineers, Fort Smith, Arkansas)

Source: Population Trends, Table 2, Page 8
Socio-Economic Profile, (1977) Northwest Arkansas Economic Development District, Inc.

then decreases and levels off within 15 years from the date it was filled. This means that fishing in the lake leveled off in the 1960's. The decrease in fish production has not hampered increased population growth. The highest population increases for towns surrounding the lake have occurred since 1970.

The Lakeview area will remain an attractive and peaceful community to live in. The anticipated population will reflect a balanced community with the character and life-style expected by those who live there.

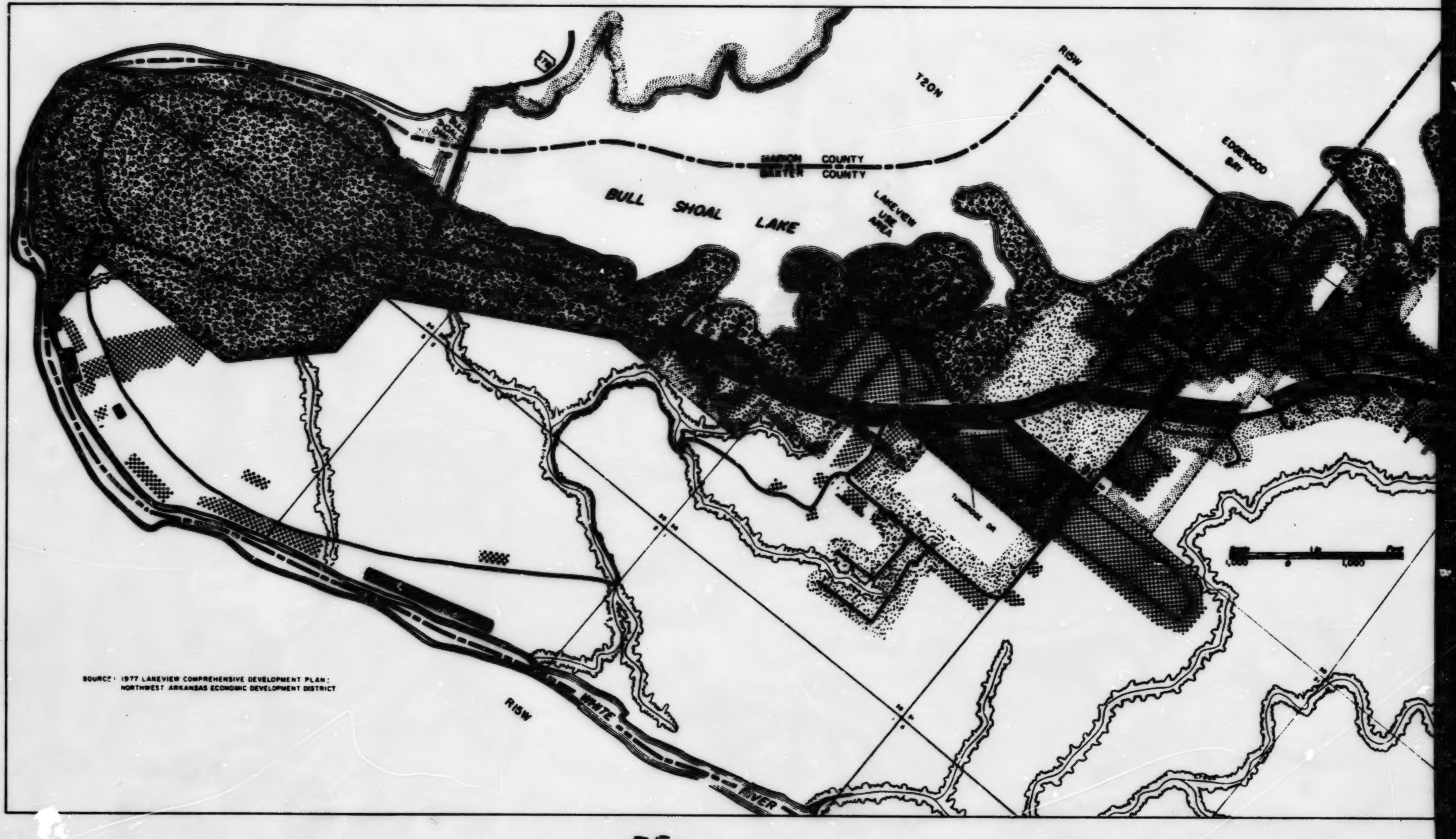
b. Land Use

Lakeview's corporate limits cover about 665 acres, the majority of which is undeveloped. Developed uses cover 119 acres (or 17.9 percent of the total), and the remaining 546 acres (82.1 percent) are undeveloped agricultural and open-space uses; however, 25 acres (46 percent) are platted for development. Exhibits 19 and 20 show the current land uses. Residential uses comprise 65.3 acres (54.8 percent of the developed uses) with a 1977 total of 212 dwelling units -- 202 single-family, 6 two-family and 4 multi-family. The commercial development (40 establishments or 133 individual units) is for the most part located along State Highway 178, and is generally supported by the recreational activity within the area.

5.4.2 Effects of Construction on Socio-Economic Elements

People will not be relocated as a result of the project, and construction will have no direct effect on the population of Lakeview.

The treatment plant will take about eight acres of bottom land pasture near the White River. Because the area is presently undeveloped, building the treatment plant will alter its present character. In addition, the several collection system pumping stations will require small enclosures.


T20N
R15W
MARION COUNTY
BAXTER COUNTY
BULL SHOAL LAKE
LAKEVIEW USE AREA
EDGEWOOD BAY
WHITE RIVER
R15W
1,000
0
1,000

SOURCE: 1977 LAKEVIEW COMPREHENSIVE DEVELOPMENT PLAN;
NORTHWEST ARKANSAS ECONOMIC DEVELOPMENT DISTRICT

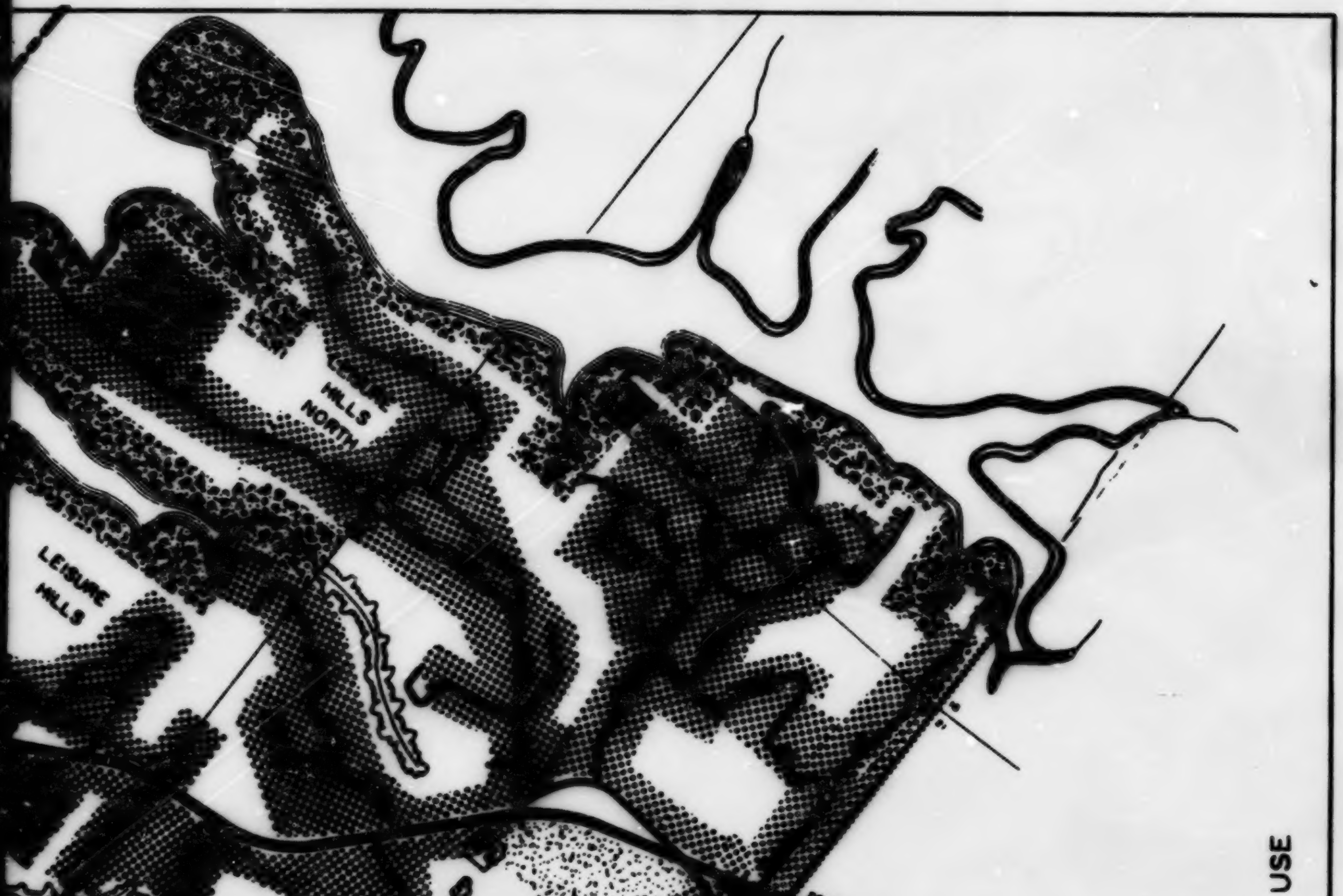
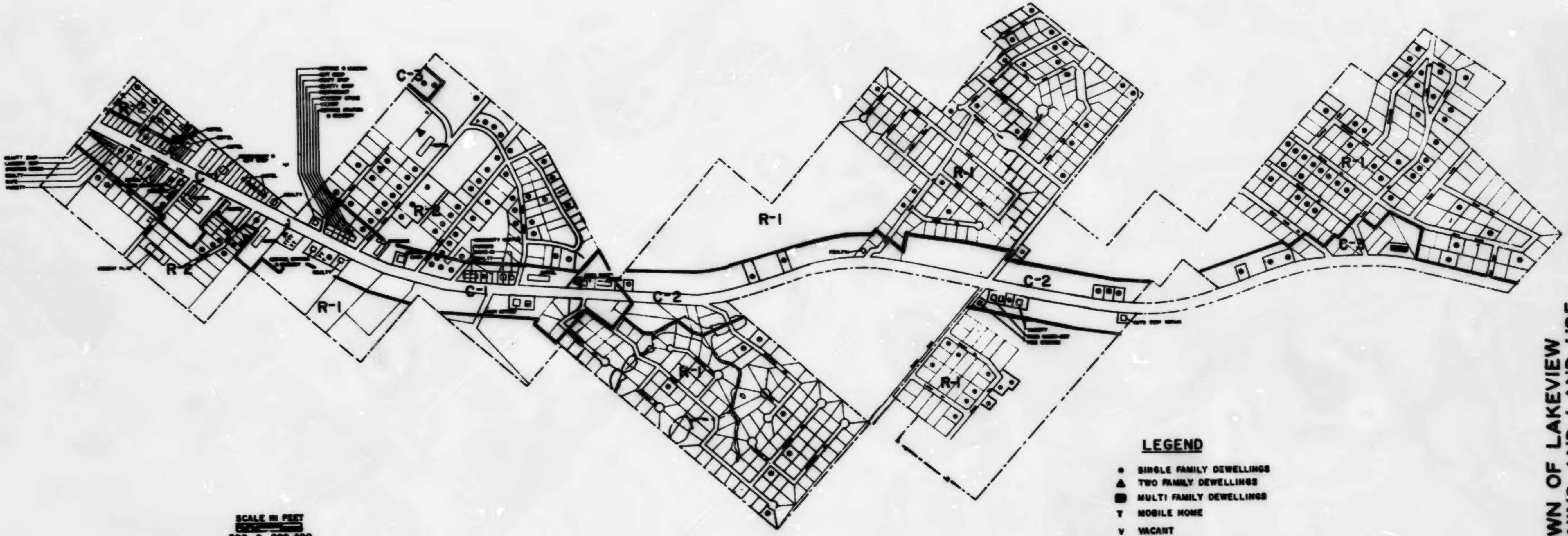

HILLS NORTH
LEISURE HILLS
T20N
LEGEND
RESIDENTIAL
COMMERCIAL
RECREATIONAL OPEN SPACE & PROTECTED DRAINAGE-SHORELINE
MINOR ARTERIAL ROADS
LOCAL COLLECTOR
PROTECTED DRAINAGEWAYS
SECONDARY DEVELOPMENT

EXHIBIT 19 LAKEVIEW AREA LAND USE

EXHIBIT 20 TOWN OF LAKEVIEW
ZONING AND LAND USE



TOWN OF LAKEVIEW

SCALE IN FEET
200 0 200 400

SOURCE: 1977 LAKEVIEW COMPREHENSIVE DEVELOPMENT PLAN;
NORTHWEST ARKANSAS ECONOMIC DEVELOPMENT DISTRICT

LEGEND

●	SINGLE FAMILY DEWELLINGS
▲	TWO FAMILY DEWELLINGS
■	MULTI FAMILY DEWELLINGS
T	MOBILE HOME
V	VACANT
	NON RESIDENTIAL USES ARE AS ANNOTATED
R-1	SINGLE FAMILY RESIDENTIAL
R-2	SINGLE & MULTI FAMILY RESIDENTIAL
C-1	PRIMARY COMMERCIAL
C-2	SECONDARY COMMERCIAL
C-3	THIRD COMMERCIAL

The necessary land will be acquired by the city through the eminent domain process. Although the subject property is located outside the town limits, Arkansas State Statutes give city officials the authority to acquire land for specific public work projects within a 10-mile radius of the city or town.

Constructing the Lakeview sewer system will cause temporary and localized disruption of the community's social environment which will, at times, be a major inconvenience. A certain amount of blasting is expected to be required to facilitate the mechanical operations of trench excavation. Blasting, of course, can be dangerous, but it need not be if appropriate precautions are taken. When blasting does occur, proper consideration will be given to adjacent structures to avoid damage to private property.

Much trenching will be required when construction starts, and this will disrupt the present community circulation patterns. Appropriate construction techniques will to a large extent minimize this problem. Excavation and pipe installation will proceed concurrently and in only one part of the community at a time. Barricades will be installed around the work site to protect both pedestrian and vehicular traffic. Generally, however, pedestrian traffic should not be inconvenienced to the extent that vehicular traffic will be.

The substantial monetary investment will have both short- and long-term benefits for the area's economic structure. The most important short-term benefit will be construction employment opportunities. While these jobs will be of relatively short duration, they will stimulate secondary economic effects as the investment passes through the area's economic structure. Although Lakeview will benefit economically from constructing the sewer system, the region will probably experience greater benefits. Since there are no construction companies in Lakeview, the town will have to contract with a non-local firm, which means the employment opportunities, salaries, and profits will largely be felt outside of the community.

5.4.3 Effects of Operation on Socio-Economic Elements

5.4.3.1 Primary Effects. Primary effects are those resulting directly from the project.

a. Population

There will be no direct effect on population from operation of the project.

b. Land Use

There will be no long-term direct effect on land use from operation of the project.

c. Economic Effects

An estimated annual income of $84,197 will be required to finance Lakeview's share of the project cost (See Exhibit 13) with an average cost per unit of $10.45/month or $125.40 year including costs of private sewer line hook-up and filling existing septic tanks with gravel. This cost represents about 1.57% of a family income of $8,000 per year or 0.96% of the U.S. median family income of about $13,000 per year.

Operating and maintaining the proposed facility will have long-term economic effects. One or more jobs will be provided by the City to monitor and maintain the system.

d. Aesthetic Effects

Visual effect of the treatment plant on natural beauty is an adverse impact which cannot be avoided. Visual impact of the treatment plant will be minimized by setting the plant back from the River and landscaping, including trees to supplement the thin existing river bank border at the proposed plant site. The treatment plant facilities will have a maximum height of about 20 ft above ground. Since the ground is about 25 ft above normal water level, this bank elevation should also be used to break the line of sight from the river to the treatment plant.

5.4.3.2 Secondary Effects. Secondary, or indirect, effects may appear immediately after construction is completed, but there is usually a time delay before they are noticed. Several such effects are identified herein: induced population growth, land use, induced community development, the need for additional community services, and economic effects.

a. Population

The project is not expected to greatly affect the type of development within Lakeview, and the community will retain its present recreationally-oriented retirement-community character. Constructing the project will enhance and, to a limited extent, stimulate the ultimate growth potential of this already rapidly growing community. Given its location as a lakeside community in an area of already rapid growth and inmigration, Lakeview will inevitably attract some of this regional activity.

The Lakeview service area is projected to grow to a sizeable 3,000 people by 1995 with or without added treatment facilities. The surrounding communities (other than Mountain Home) should be noted as having grown without public sewer systems.

Arkansas law requires each septic system site pass a percolation test before the system can be installed. The ultimate population growth without the project will partly depend on the overall saturation point of the soil on an individual lot basis, as well as the collective effect of numerous individual septic tank systems. The present 555 platted lots within the town limits can not legally be required to provide additional space for leach fields. Septic tank development, therefore, cannot be prohibited or appreciably altered under existing controls. Substantial problems are likely to occur continuously over the next 20 years in present and future septic systems because of troubles inherent in septic tank systems, the area's soils, topography, and small-lot development characteristics.

b. Community Development and Land Use

The sanitary sewer system will greatly enhance the efficiency with which land can be used, and will ultimately alter both the rate and density of development. While a variety of land-use categories can be more densely developed, the greatest effect is expected in the residential housing market.

The project is not expected to change the type of development. Future land-use trends are expected to follow the already established patterns, with most of the residential development occurring on the north side of State Highway 178 and strip commercial-development all along the same facility. Industrial development is not expected in the project area and the proposed project is not expected to change this. New homes and services attracted to the area will, in the long term, benefit the economy, tax base, and employment opportunities. Recreational areas will more easily be upgraded and expanded because sewage treatment and disposal will no longer be an obstacle.

1. Residential Development

Thus far, residences have been built in those parts of Lakeview where land was made available for development purposes. These are in the older, more intensely developed areas in the western part of the community, and in the newly-platted, yet more sparsely developed, areas in its eastern sector. The principal effects of the proposed sewer system can be expected to be in locations which are not yet platted for development.

Residential growth will initially occur in those generally vacant areas that have already been platted (555 lots). All such locations north of Arkansas Highway 178 will be particularly susceptible to this activity. Areas of secondary development potential will include the platted areas south of the same highway, and the occasional vacant areas in the older parts of the City. The new developments will basically be single-family units. The large majority of residential areas are zoned only for single-family residences, with multi-family housing designated for the southwestern sector of the community near the major tourist-type commercial developments. Given the character of the existing multi-family housing in Lakeview, this more intense residential use will probably not be greater than six-family units.

Large areas of residentially developable land in town (249 acres) have not been platted simply because the land is not yet prime for development. The principal effect the proposed system will ultimately have on Lakeview will be to increase the value of these larger undeveloped and unplatted parcels within and outside the town limits through an enhancement of their ultimate use-potential. As a result, the future value of these areas can be expected to simply become too great to be either left unused or remain in agricultural production. An additional 498 units or more (2.50 x 498 = 1,245 people) can be built after 1995 if the 249 acres within the town limits are developed.

2. Commercial Development

Recreation is the present basis for Lakeview's economy. Induced commercial activity is more a matter of population growth and the further development of a well-defined market area. The proposed sewer project is not expected to have any direct effect on future commercial development. Commercial development will, instead, be more dependent upon induced population growth resulting from increasing recreational activity and Lakeview's status as a retirement community. However, since many commercial establishments are experiencing septic system problems, a sewer system will alleviate existing conditions and will make it easier to expand and solve operational and maintenance problems.

Certain minor changes can be be expected to occur and, if the project is built, local commercial activity will eventually become more diversified and serve not only a recreation-oriented population, but also a larger number of permanent residents. Diversification will not only be evident as a larger number of retail outlets, but also as a larger number of retail functions. Commercial activity will probably continue to be located on State Highway 178, extending eastward from the present retailing area.

3. Recreational Development

Tourism and recreational activities have been, and are, the basis for continued community development. Although fishing on the lake has decreased from its peak production period, the overall use of recreational facilities has fluctuated with the economy since 1972 as shown in Exhibit 21.

The 1977 figures show an increased number of people visited the general Lakeview area. The 1976 figures are the lowest because an extremely dry year caused the lake level to drop 20 ft.

Exhibit 21

Recreational Visitors at Lakeview Area Facilities

(Source: Little Rock District Corps of Engineers)

	1972	1973	1974	1975	1976	1977
Lakeview	315,325	275,133	248,443	304,091	213,978	276,004
Dam Area	1,185,593	771,452	885,180	1,052,350	727,802	969,809 Est.
Bull Shoals	136,573	141,552	143,502	137,439	96,548	110,981
STATE TOTAL	3,939,654	3,066,286	3,695,340	4,385,656	3,885,447	___

The heavy use-trend will continue and the proposed sewer system will be an added convenience for visitors. The community will be better able to accommodate a larger permanent and seasonally-transient population, allowing more people to take advantage of Lakeview's recreational opportunities. Without the project, the potential problems of septic systems will, in the long term, detract from the attractiveness of the area.

4. Additional Community Services

Lakeview officials will have to evaluate the need for additional community facilities, services, and programs to properly handle the expected increased growth with the project beyond 1995. The Lakeview-Midway Water Association will require storage in the Lakeview area as well as enlarged mains prior to 1995. Solid waste handling and landfill facilities appear adequate.

c. Economic Effects

At least part of the salaries of those operating the system can be expected to be returned to the community through spending for goods and services since these employees can be expected to come from the community. The other long-term economic effect will not accrue to the community or its inhabitants since these involve purchasing maintenance chemicals and supplies not available in Lakeview.

Lakeview's economy is primarily geared to recreational activities associated with the lake. Consequently, the small shops, motels, and boat facilities will grow and prosper as the community grows and additional leisure time is directed toward water-related activities. Area residents will therefore, have additional employment opportunities and the young and elderly will have seasonal employment. Such effects attributable to the project will occur beyond 1995.

5.5 AIR AND SOUND QUALITY

5.5.1 Effects of Construction on Air and Sound Quality

Quiet, residential areas of Lakeview can be expected to have low noise levels of about 40 to 50 decibels (dB). Disruptive noise from construction will be a primary short-term adverse impact. Noise will be generated by motorized trenching equipment, blasting, and the excavation and erection equipment at the treatment plant site. The contractor will be required to have proper mufflers on all construction equipment. The equipment required for this project such as backhoes, tractors, compressors, jack hammers, and drills typically generate noise in the range of 80-95 dB at a 50-ft distance (EPA, 1976b).

Much of the project area will be subject to blasting. Most of the blasting is anticipated during construction of lines on the steeper hillsides. Relatively little blasting should be required on the Lakeview plateau, with minimal blasting at the treatment plant and other river bottom sites.

Rock blasting at shallow depths is not overly irritating or disturbing if it is properly controlled and executed by persons thoroughly experienced in this line of work, residents are properly notified, and the blasting is done at infrequent intervals and during hours compatible with the community lifestyle. Shielding and padding will be used to minimize the noise effects from blasting, and all construction will be during normal working hours so as not to interfere with the usual "quiet hours." Warnings will be given to residents before each detonation, and all blasting will be done in accordance with accepted safety procedures.

The primary short-term adverse air pollution effects include emissions from construction vehicles and dust associated with the excavation work and traffic. Since the number of construction vehicles will be small, emissions will be negligible on an area basis. Minor local annoyance from fumes and odors might occur during periods when air circulation is poor. Nuisance dust conditions near residential areas and thoroughfares will be controlled by spraying with water as well as proper mulching and reseeding. Neither the problem nor the control measures should be too difficult if construction proceeds in a localized step-by-step basis.

5.5.2 Effects of Operation on Air and Sound Quality

Although the various pump stations will be located within 100 to 200 ft of residences and commercial establishments, noise from these facilities will not be objectionable because of the small pump sizes and provision of proper enclosures or installation below ground. Noise levels of about 70 dB can be expected from the pumps, and an enclosure will reduce this level to approximately 30 dB or the equivalent of a whisper. Noise-generating equipment at the treatment plant site on the White River will be similarly contained.

Since prevailing winds are from the south and southwest, major odors indicating a malfunction of the treatment plant could conceivably be noticed at residences and business about a mile north. Reliability features and proper operation will minimize the chance of such occurrence, however. Odors at the pump stations will cause little problem if the wastes are transported quickly to the treatment plant before anaerobic, odor-causing conditions can develop. Proper design of the pump stations and other system components is essential, and the small size of Lakeview will aid in avoiding odor problems.

5.6 ARCHEOLOGY AND HISTORY

5.6.1 Effects of Construction on Archeology and History

The National Register of Historic Places lists no historic sites in the project area, and the State Historic Preservation Program indicates no property of architectural or historical significance will be affected by construction of the proposed project.

A preliminary survey by the Arkansas Archeological Survey found a large archeological site in the White River valley at the proposed treatment plant location. Outside of the valley bottom, no findings were made along proposed sewer lines, which are generally located in disturbed residential and street areas. Further archeological testing and excavation conducted in the valley bottom by the Arkansas Archeological Survey revealed that significant archeological resources are located at the proposed treatment plant site.
These resources would be adversely impacted by the construction of this facility. One site (3BA66a) is considered to be eligible for nomination to the National Register of Historic Places. The archeological survey indicates that two major concentrations of cultural materials, designated as sites 3BA66a and 3BA66b, are present in the valley. Site 3BA66a, an unusually large site for the area, was occupied from early Archaic to Woodland times, and has relatively deep deposits (at least one meter), which are undisturbed below the shallow plowzone. This site would be severely damaged by the construction of the treatment plant at its proposed location. 3BA66b is a large Mississippian site which has potential importance, but would not be directly impacted by the proposed project.

Mitigative measures incorporated to alleviate adverse impact to these sites will include a Facility Plan addendum moving the proposed treatment plant location to the west so the eastern boundary coincides with test pit XU3. The Archeological Survey will be notified when construction of the outfall line and Interceptor A has been scheduled and construction personnel will be alerted to be looking for evidence of prehistoric occupation, i.e., stone tools, bone, and pottery shards in construction areas. Should any resources be encountered, work will be halted and the Arkansas Archeological Survey will be notified immediately so that provisions are made for appropriate data recovery.

The Federal Advisory Council on Historic Preservation will be informed of these findings so that they may comment in accordance with the National Historic Preservation Act as amended. The Advisory Council will be allowed to comment according to its procedures (36 CFR 800) if any additional resources are encountered during construction.

5.6.2 Effects of Operation on Archeology and History

There will be no effects on archeology and history from operation of the project.

6. COORDINATION

6.1 COORDINATION AND PUBLIC PARTICIPATION

Several public meetings and a July 22, 1976 public hearing were held during the planning stages of the proposed project. Federal, state, and local agencies, and interested individuals and groups were contacted for information and views during the EIS preparation. Questions and concerns expressed included the suitability of on-site disposal alternatives; cost and economic effects; secondary effects upon growth and development; projected growth and wastewater flow estimates; and whether several jurisdictions outside the incorporated Lakeview area will participate.

A report by the Ad Hoc Committee for EIS Input led by Messrs. R. E. Lee, W. McElroy, and Dr. A. W. Weitkamp discussed the above and other concerns in detail, and Committee members and other interested parties were consulted during the EIS information gathering period.

6.2 CORRESPONDENCE

The following is a list of correspondence on project problems and issues which is included as Appendix A.

Arkansas Department of Pollution Control and Ecology comments of October 20, 1976 on the Lakeview Facility Plan; response of November 16, 1976 as Facility Plan Addendum #1; and December 9, 1976 letter of the ADPCE requiring dechlorination.

Arkansas Department of Parks and Tourism January 25, 1977 letter concerning Bull Shoals State Park participation in the system.

Arkansas Game and Fish Commission October 4, 1977 letter concerning thermal effects of the proposed discharge on the White River trout fishery.

Dr. A. W. Weitkamp's October 12, 1977 letter concerning per-capita water use.

Dr. A. W. Weitkamp's October 24, 1977 letter concerning control of population density.

Engineering Services, Inc. October 26, 1977 letter concerning costs of serving Bull Shoals State Park and the Lakeview Recreation Area.

U.S. Army Corps of Engineers November 7, 1977 letter concerning Lakeview Recreation Area participation in the system.

Engineering Services, Inc. December 1, 1977 letter concerning user charges and costs for connecting to the Town of Bull Shoals system.

Engineering Services, Inc. January 10, 1978 letter concerning project costs clarification.
Archeology (4 letters)

6.3 REVIEW PROCESS AND PREPARATION OF FINAL EIS

The Draft EIS has been distributed to Federal, State, and local agencies, and interested individuals for review and comment on the proposed project. Future coordination activities, including comments received from individuals and agencies, and EPA's responses to those comments, will be included in the Final EIS.

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APPENDIX A - Correspondence

L.V. Ark

STATE OF ARKANSAS
DEPARTMENT OF POLLUTION CONTROL AND ECOLOGY
8001 NATIONAL DRIVE
LITTLE ROCK, ARKANSAS 72209

501 371-1701 GEN. OFF.
501 371-1136 AIR DIV.

October 20, 1976

Mr. Jerry W. Martin, P.E.
Engineering Services, Inc.
214 West Emma
Springdale, Arkansas 72764

Dear Mr. Martin:

Re Facility Plan
Lakeview, Arkansas
EPA Project No. C-05-0441-01-0

Your facility for Lakeview has been reviewed. Our comments on the report are below.

1. Page 1/Subsections B.1.a.(3) and (4).
Has the Arkansas Department of Parks and Tourism committed itself to connect the Bull Shoals State Park wastewater system to the proposed project?

2. Page 1/NOTE (at bottom of page) 2nd and 3rd Sentences.
Could a reasonable estimate of the wastewater flow be made from a study of the Lakeview-Midway Water Association water consumption records?

3. Page 8/Subsection C/Last Paragraph.
Since the volume of sludge will be small and infrequent, has the possiblity of land application been carefully explored as opposed to burying it in a highly fractured limestone area?

4. Page 18/Subsection 2.
What controls will be taken to prevent illegal tieons before the works are finished?

5. Appendix "B".

   a. Department records indicate 250 mg/l is a more favorable BOD_5 design concentration for communities in Arkansas. Please revise your treatment units with this figure in mind.

   b. Rapid sand filters without chemical precipitation have a poor track record in Arkansas. Because of this the Department casts a reluctant eye towards them. Request you please reconsider your design using intermittant sand filters. A loading rate of 5 to 10 Gal/SF/Day is acceptable to the Department. At least three beds and perferably four need to be considered to insure flexibility of operation.

80

c. Since White River below Bull Shoals Dam is a trout stream, dechlorination of the effluent after disinfection must be considered.

6. Environmental Assessment/Appendix "C"/Archeological Report/ Pages 4 and 5/Recommendations.
The recommendations of this report need to be closely followed.

7. What is the estimated manpower requirement for proper operation and maintenance of the proposed wastewater system?

8. The facility plan must include a "User Charge Schedule" and "Cost Recovery System" to show that sufficient revenues will be collected by the community to pay its matching share plus the ability to exercise an effective operation and maintenance program.

9. Have the citizens of the community been notified that abandoned septic tanks must be filled in with gravel?

Return your answers as an addendum to be attached to the facility plan.

Sincerely,

Martin H. Roy
Engineer
Water Pollution Control Division

MHR:nrt

cc/Thomas Bercher, Asst. Project Consultant

ADDENDUM NO. 1

FACILITY PLAN

LAKEVIEW WASTEWATER COLLECTION

&

TREATMENT SYSTEM

LAKEVIEW, ARKANSAS
C-05-0441-01-0

The following information is supplied in reply to the comments contained in the letter from the Arkansas Department of Pollution Control and Ecology dated October 20, 1976:

1. Page 1/ Subsections B.1.a. (3) and (4)

The Arkansas Department of Parks and Tourism has not committed itself to connect the Bull Shoals State Park wastewater system to the proposed project. The Parks Department Engineer has verbally indicated interest in connecting the State Park to the proposed system. This was followed up by a letter to the Department of Parks and Tourism dated January 9, 1976. No official reply was received to that letter.

A copy of the Facility Plan was submitted to the Arkansas Department of Parks and Tourism on October 19, 1976 for their review and comment. As of this date, no comments have been received.

2. Page 1/ Note (at bottom of page) 2nd and 3rd sentences

An attempt was made to estimate the wastewater flows from a study of the Lakeview - Midway Water Association records. However, the information provided by the Water Association resulted in water consumption figures which, in our opinion, were unreasonably low. Close examination of their records revealed a large number of customers who were simply paying a minimum bill and were not even connected to the water system. We feel like the figures presented on page 1 of the Facility Plan are much more accurate.

3. Page 8/ Subsection C/ Last Paragraph

Current plans call for burial of sludge at the treatment plant site. It is aniticipated that the soil will be silt and clay to a suitable depth in this particular area along the White River. In the event soil conditions preclude the safe burial of sludge, land application under controlled conditions may be utilized.

4. Page 18/ Subsection 2

We do not anticipate a problem with illegal tieons prior to completion of the project. Such unathorized connections are clearly a violation of Article IV, Section I of the proposed Sewer Use Ordinance and this will be strictly enforced by the Town of Lakeview.

5. Appendix "B"

A. Appendix "B" has been revised based on 250 mg/l influent BOD_5.

B. The use of intermittant sand filters was considered. Based on a loading rate of 10 GAL/SF/DAY, a minimum of 30,000 square feet of filter area would be required. When comparing the cost of such an installation to the cost of rapid sand filters, the decision was made to use rapid sand filters. The unit processes of the treatment plant were purposely selected so that chemical precipitation could be included if necessary. In view of the comment from the Arkansas Department of Pollution Control and Ecology, such chemical precipitation facilities will be included intially in the treatment plant design.

C. The need for dechlorination of the effluent after disinfection was seriously considered. However, with the minimum flows available in the receiving stream, the White River, it was felt that adequate dilution of any chlorine residual would be provided so as not to adversly affect the trout waters.

According to information furnished by the Little Rock District Corps of Engineers, the minimum projected flow in the White River below Bull Shoals Dam is 150 cfs. The lowest recorded flow since the completion of Bull Shoals Dam was 250 cfs.

Using the 150 cfs figure and assuming that our maximum effluent discharge will be approximately 310 gpm with a chlorine residual of 2 ppm, a chlorine dosage in the stream of less than 0.01 ppm would result. This would be under the most extreme conditions.

6. Environmental Assessment/ Appendix "C"/ Archeological Report/ Pages 4 and 5/ Recommendations

The recommendations of this report will be closely followed.

7. It is estimated that it will require one full time and one part-time person to properly operate and maintain the proposed system.

8. According to the Environmental Protection Agency, Region VI, the "User Charge Schedule" and "Cost Recovery System" do not have to be completed until midway of the Step II program.

9. The citizens of the community have not as yet been officially notified that abandoned septic tank systems must be filled in with gravel. The sewer use ordinance will be amended to include this requirement.

November 16, 1976

Jerry W. Martin

Jerry W. Martin, P.E.
ENGINEERING SERVICES, INC.

STATE OF ARKANSAS
DEPARTMENT OF POLLUTION CONTROL AND ECOLOGY
8001 NATIONAL DRIVE
LITTLE ROCK, ARKANSAS 72209

501 371-1701 GEN. OFF.
501 371-1136 AIR DIV.

December 9, 1976

Mayor Claude W. Shonkwoler
Lalser
P.O. Box A.F.
Lakeview, Arkansas 72642

Dear Mayor Shonkwoler:

We have received your 201 Facility Plan and have forwarded to EPA, Dallas. The basic concepts of the plan have been approved, however the STP will require dechlorination prior to discharge. The basis for this decision is report number EPA-430/9-75-012 March, 1976, titled Disinfection of Wastewater. Dechlorination will be required because of the quality of the stream into which the city will discharge.

It is also necessary that we be formally notified of any changes in signatory authority.

If we may be of further assistance please advise.

Sincerely,

Tom Bercher

Tom Bercher
Asst. Project Consultant

TB/ch

cc: Jerry W. Martin/ Engineering Services, Inc.

ARKANSAS DEPARTMENT OF PARKS & TOURISM
PARKS DIVISION

David Pryor
Governor
William E. Henderson
Director

1510 Broadway • Little Rock, Arkansas 72202 • Telephone (501) 371-1191

Richard Davies
Director of State Parks

January 25, 1977

Mr. Jerry W. Martin, P.E.
Engineering Services, Inc.
214 West Emma
Springdale, Arkansas 72764

Dear Mr. Martin:

Thank you for forwarding a copy of the plan for the proposed Lakeview Wastewater Collection and Treatment System near Bull Shoals State Park. I will forward this on to our Planning and Development section.

We feel that it is usually advantegous for one of our state parks to tie on to a local waste water system if possible. However, you may know that we have recently completed a sewer plant at Bull Shoals and we will have to study the situation further and get cost quotations from the City of Lakeview before we make a firm commitment for Bull Shoals State Park to tie in to the system.

Thank you again for sending the plan.

Sincerely,

Richard W. Davies
Director, Arkansas State Parks

RWD:qmg

cc: Bob Moody

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ANDREW H. HULSEY, Director

Arkansas
Game and Fish Commission

LITTLE ROCK, ARKANSAS 72201

October 4, 1977

Mr. Roga Stojeba
Planning Division
Sverdrup Parcel and Associates
800 North 12th Boulevard
St. Louis, MO 63101

Dear Mr. Stojeba:

At your request we are enclosing temperature data from our continuous recording thermometers located at Cotter and approximately two miles upstream from Shipps Ferry on the White River. This data includes a summarization of one full year of recordings from the Cotter Station during 1975. It reflects the daily water temperature extremes, the variation between daily high and low temperatures, and daily average temperatures. In addition, copies of several of the weekly temperature charts are enclosed. These particular charts were selected from weeks during this summer period in which there were extreme high temperatures recorded on the White River. These charts are from both the Cotter Station and the Courtney Station (above Shipps Ferry).

You will note from the 1977 charts that there were several days during this summer in which water temperatures reached 75° or above during the daylight hours. Temperatures of this extreme are very critical to our trout program that exists in the White River. It is therefore obvious that with such marginal temperatures that regularly occur in the White River as a result of low generation from Bull Shoals dam, any additional warming of this water from effluent releases of any type could have a severe affect on the multi-million dollar trout fishery that exists in the White River. We would therefore be very concerned about any additional water releases that could possibly increase water temperatures at any point on the White River between Bull Shoals dam and Sylamore.

Hopefully, this information will provide you with the necessary data to make the analysis that you desire concerning the city sewage effluent from the Lakeview area below Bull Shoals dam.

If you need additional information that you feel we have on hand, please advise us and it will be furnished to you.

Yours truly,

William E. Keith, Chief
Fisheries Division

WEK/amcg

Enc.

MICROFILMED FROM
BEST AVAILABLE COPY

Box 90, Route 1
Lakeview
Arkansas 72642

October 12, 1977

Mr. Roger N. Jungclaus, P.E.
Sverdrup & Parcel and Associates, Inc.
800 Nornt 12th Boulevard
St. Louis
Missouri 83101

Dear Mr. Jungclaus:

Mr. McElroy joins me in saying that it was both pleasant and constructive to meet with you last week.

Since our conversations, I have followed up briefly on per capita water usage in Edgewood Bay Subdivison. Since becoming Water Commissioner a couple of years ago, Mr. Martin Feil has been totalling the individual meter readings to obtain a total water usage figure for each quarter. As expected, the summer quarters reflect heavy lawn and garden watering. For the first and fourth calendar year quarters when lawn and garden use would be minimal, the total usage ranged from slightly below to slightly over one million gallons. On the basis of 91 days in the quarter, approximately 90 home in the subdivision, and two persons per average household the average water use figures very close to 60 gallons per person per day.

Even in the winter quarters some of the water usage will not find its way into the waste water disposal system. Some will have been used for car washing, houseplant watering, humidification and some lawn and garden watering. This will be offset in greater or less degree by increased use of laundry and bathwater in the summer quarters. If you have not already done so, you can and probably should get more detailed and official data from Mr. Feil.

In any case the 140 gallon per capita figure adduced by Engineering Associates, Inc. has very questionable antecedents and will certainly be challenged at the Public Hearing on the EIS. It is difficult to see how the presently proposed plant could qualify for Federal funding under existing EPA guidelines.

We remain willing to help in any way we can.

Sincerely yours,

A. W. Weitkamp

Box 90, Route 1
Lakeview
Arkansas 72642

October 24, 1977

Mr. Roger [illegible]. Jungclaus
Sverdrup & Parcel and Associates, Inc.
800 North 12th Boulevard
St. Louis
Missouri 63101

Dear Mr. Jungclaus:

I am attaching a copy of a letter to EPA requesting information on some recently publicized changes in their philosophy.

I will grasp this opportunity to comment on your statement that there are other ways to control population density. After you studied the Bull Shoals Environmental Impact document, I am sure that you noted that the proponents of sewers relied heavily, if not totally, on the concept that sewers provided the only viable route to enhanced population density and to the total exploitation of otherwise unbuildable lands.

Fortunately for the consideration of alternatives, the stated policies of EPA are currently veering toward solution of actual wastewater disposal problems rather than maximizing the dispensation of Federal funds.

I look forward to seeing your report.

Sincerely yours,

A. W. Weitkamp

Dr. A. W. Weitkamp

ENGINEERING SERVICES, INC.

214 west emma
springdale, arkansas 72764
telephone 501-751-8733

max hall, p.e., r.l.s.,
president
jerry martin, p.e.,
vice-president

e. walt lefevre, p.e.,
senior vice-president
gary l. king,
secretary-treasurer

October 26, 1977

Mr. Roger Jungclaus
Sverdrup & Parcel
800 North 12th Street
St. Louis, MO 63101

Re: Wastewater Collection
& Treatment Facilities
Lakeview, Arkansas
C-05-0441-01-0

Dear Mr. Jungclaus:

Attached is the cost breakdown for eliminating the State Park and Corps of Engineers Park from the proposed sewer project at Lakeview, Arkansas. The costs shown reflect the cost necessary to provide sanitary sewer service to Bull Shoals State Park and the Lakeview use area of the Corps of Engineers. If these two (2) facilities were eliminated from the project these amounts could be subtracted from the total project amount.

In regards to the cost per person of the proposed project this could be obtained from the information in the Environmental Assessment and the Facility Plan. Based on the projected population equivalent for the year 1980 (1,605) the cost per capita would be $981.00 ($1,574,825.00 ÷ 1,605). If you subtract out the cost for eliminating the State Park and Corps of Engineers Park ($120,400.00 + 50,100.00 = $170,500.00) and the population equivalent from these two (2) facilities (230 + 250 = 480) the cost per person would be $1,248.00 ($1,404.325.00 ÷ 1,125).

I trust that this is the information which you desire. If I can be of any further assistance, please do not hesitate to call upon me.

Sincerely yours,

Jerry W. Martin

Jerry W. Martin, P.E.

JWM/csm

Enclosures

cc: Honorable Claude Shonkwiler
Mayor, Town of Lakeview

PROJECT COST BREAKDOWN

STATE PARK AND CORPS OF ENGINEERS
LAKEVIEW, ARKANSAS
C-05-0441-01-0

	BULL SHOALS STATE PARK	CORPS OF ENGINEERS LAKEVIEW USE AREA
Distribution System	$ 48,200.00	$17,000.00
Treatment Plant	45,000.00	21,000.00
Contingency	9,000.00	4,000.00
Total Construction	$102,200.00	$42,000.00
Engineering Cost		
Design	6,600.00	2,700.00
Construction Observation	4,100.00	1,700.00
Legal & Administrative Costs	1,000.00	500.00
Land & Right-of-Way	2,500.00	1,200.00
Interest During Construction	4,000.00	2,000.00
TOTAL COST	$120,400.00	$50,100.00

91

DEPARTMENT OF THE ARMY
LITTLE ROCK DISTRICT, CORPS OF ENGINEERS
POST OFFICE BOX 867
LITTLE ROCK, ARKANSAS 72203

REPLY TO
ATTENTION OF

SWLED-PV

7 November 1977

Mr. Roger Jungclaus, P.E.
Sverdrup & Parcel and Associates, Inc.
800 North 12th Boulevard
St. Louis, Missouri 63101

Dear Mr. Jungclaus:

As requested in your 27 October 1977 letter, a copy of our 3 February 1976 letter to Engineering Services, Inc. is inclosed. There has been no further change or development concerning the Corps making a commitment for using the proposed Lakeview system. Also, we have no revised estimates for wastewater flows at the Lakeview Park.

With regard to your question concerning the Norfork lagoon system, we do not believe it is an acceptable long term arrangement. From a long term viewpoint, we believe that other alternatives must be considered to provide for waterborne restrooms and showers. Possible alternatives are providing central treatment systems for individual parks or connecting to regional or local sewage treatment systems.

Planning for Corps recreational facilities is a continuing process and is responsive to changes in laws and policies. Currently, our policies provide: (1) Except for needed sanitary facilities to comply with State and Federal laws, new construction of recreation facilities at existing projects will be by cost sharing with a non-Federal public entity which agrees to assume operation and maintenance responsibilities. (2) User fee funds may be used to convert vault to waterborne restrooms and to provide for showers. When a decision is made to construct the Lakeview system and the cost for our use of the system is determined, we will evaluate our priority needs with regard to funds and make a decision concerning connection to the system.

SWLED-PV 7 November 1977
Mr. Roger Jungclaus, P.E.

Our financial participation in the proposed system would be limited to a reasonable portion (in proportion to the Lakeview Park sewage flow) of the first cost of the new plant. If this proportion method was used, then we would not be able to pay a monthly user fee. I hope this is sufficient clarification for your purpose.

Sincerely yours,

1 Incl
As stated

D. R. RIPPEY
Chief, Engineering Division

93

ENGINEERING SERVICES, INC.

214 west emma
springdale, arkansas 72764
telephone 501-751-8733

max hall, p.e., r.l.s.,
president
jerry martin, p.e.,
vice-president

e. walt lefevre, p.e.,
senior vice-president
gary l. king,
secretary-treasurer

December 1, 1977

Mr. Roger N. Jungclaus, P.E.
Sverdrup & Parcel and Assoc., Inc.
800 North 13th Boulevard
St. Louis, MO 63101

Re: Wastewater Collection &
Treatment System
Lakeview, Arkansas
C-05-0441-01-0

Dear Mr. Jungclaus:

Attached as you requested is the cost estimate for connecting the proposed Lakeview Sewer System to the planned Town of Bull Shoals system. The estimate includes only the facilities needed to transport the wastewater to the site of the Bull Shoals treatment plant and does not include the cost of expanding that treatment plant to handle the Lakeview wastewater. Also, if this alternative were chosen, approximately 4,100 feet of the proposed 12 inch outfall could be eliminated with a resultant cost reduction of approximately $40,000.00.

I have also attached a copy of our Preliminary User Charge Analysis which I think will provide you with the information you desire on the cost breakdown of the project on the basis of the monthly service charge. This proposed user charge system has not been approved by the Arkansas Department of Pollution Control and Ecology or the Environmental Protection Agency as we were instructed that it would not be required until Step II. However, it is the guideline which we are using in discussing monthly service charges.

In reference to Item 1 of Addendum No. 1 to the Facility Plan, attached is a copy of a letter from Mr. Richard W. Davies, Director, Arkansas State Parks which is the only official correspondence we have received from the Arkansas Department of Parks and Tourism.

Please let me know if there are any questions concerning this material or if I may be of any further assistance.

Sincerely yours,

Jerry W. Martin

Jerry W. Martin, P.E.

JWM/csm

Enclosures

cc: Honorable Claude Shonkwiler
Mayor, Town of Lakeview

Arkansas Dept. of Pollution
Control & Ecology

Mr. Steve Burkett
Environmental Protection
Agency, Region VI

# PRELIMINARY COST ESTIMATE
for
CONNECTING THE PROPOSED LAKEVIEW SEWER SYSTEM
to
BULL SHOALS
C-05-0441-01-0

ITEM	DESCRIPTION	APPROX. QUANTITY	UNIT PRICE	TOTAL COST
1	Pump Station	1 ea.	L.S.	$ 40,000.00
2	8" Ductile Iron Force Main	16,000 l.f.	$ 9.00	144,000.00
3	8" River Crossing	1,000 l.f.	25.00	25,000.00
4	Rock Excavation	100 yd^3	13.50	1,350.00
5	Bedding	200 yd^3	7.00	1,400.00
6	Concrete Encasement	15 yd^3	50.00	750.00
7	Air Relief Valves	2 ea.	500.00	1,000.00
	TOTAL ESTIMATED CONSTRUCTION COST			$213,500.00

PRELIMINARY USER CHARGE ANALYSIS
LAKEVIEW WASTEWATER SYSTEM
LAKEVIEW, ARKANSAS
C-05-0441-01-0

I. ANNUAL OPERATION AND MAINTENANCE COST

A.	Loan Payment (Based on 40 yr. loan, 5%, $400,000	$24,000.00
B.	Operation and Maintenance of Treatment Plant	20,000.00
C.	Operation and Maintenance of Collection System	20,000.00
	TOTAL	$64,000.00
	Add 10% Coverage	6,400.00
	TOTAL YEARLY REVENUE NEEDED TO MEET EXPENSES . . .	$70,400.00

II. PROPOSED USER CHARGE SYSTEM

A. Cost per 1,000 gallons of wastewater

$$\frac{\$70,400.00 \text{ yr.}}{(150,000 \text{ gallons})(365 \text{ day/yr})} = \$0.0012858/\text{gallon}$$

or $1.2858/1,000 gallons

B. PROPOSED RATE SCHEDULE

WASTEWATER VOLUME	COST
First 5,000 gallons	$6.50 minimum
All over 5,000 gallons	$1.30 per 1,000 gallons

C. TYPICAL MONTHLY SERVICE CHARGES

WASTEWATER VOLUME	CHARGE
5,000 gallons	$ 6.50
7,000 gallons	9.10
10,000 gallons	13.00
15,000 gallons	19.50

[illegible] 1-11-[illegible]

ENGINEERING SERVICES, INC.

214 west emma
springdale, arkansas 72764
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max hall, p.e., r.l.s.,
president
jerry martin, p.e.,
vice-president

e. walt lefevre, p.e.,
senior vice-president
gary l. king,
secretary-treasurer

January 10, 1978

Mr. Roger N. Jungclaus, P.E.
Sverdrup & Parcel and Assoc., Inc.
800 North 12th Boulevard
St. Louis, MO 63101

Dear Mr. Jungclaus:

Receipt is acknowledged of your letter dated December 22, 1977 concerning the Lakeview Wastewater Collection and Treatment System. The answers to your questions are as follows:

1) Our estimated cost for the project is $1,574,825.00. We have rounded this off to $1,600,000.00 in our cost analysis and have assumed that 75% of this will come from the EPA grant. It is true that certain items will be ineligible for EPA grant assistance: a) Land and right-of-way; b) 4" sewer service line. By subtracting these items from the total project cost, the EPA grant would be $1,146,337.50 leaving $428,487.50 to be paid by the Town of Lakeview. I do not know where the figures came from that were in EPA's Notice of Intent for an EIS. However, the final figures will depend upon the cost estimates developed after completion of the final construction plans and specifications.

   We were advised by EPA early in Step I that the user charge data would not be required until Step II. Therefore, we have not spent a lot of time trying to refine the figures. We plan on attempting to obtain additional grants from other sources to help keep the Town's cost within reason.

2) In regards to the cost for the pumping station to pump from the lagoons to the clarifier, this item apparently was omitted from the cost estimate. An additional $30,000.00 should be added to cover this item.

3) Concerning the loading on the sand filters, we will be pumping from the aerated lagoon into the settling tank at a rate approximately equal to the average flow based on a 16 hour day, or about 312.5 gpm. The sand filtration system will have two separate filters each capable of handling the 312.5 gpm flow at a loading of 5 gpm/ft^2. Our cost estimate was based on this system.

4) We have not developed any cost figures for dechlorination. We are studying the possibility of using another means of disinfection, such as ozone treatment. However, we have not made a decision. In fact, we had planned on this decision until we got into Step II.

   The plant as proposed in the Facility Plan has the capability of chemical precipitation.

Please let me know if I may be of any further assistance.

Sincerely yours,

Jerry W. Martin

Jerry W. Martin, P.E.

JWM/csm

cc: Honorable Claude Shonkwiler
Mayor, Town of Lakeview

Mr. Steve Burkett
EPA

Mr. C. C. Bennett
Arkansas Dept. of Pollution
Control & Ecology

ARKANSAS HISTORIC
PRESERVATION PROGRAM

FIRST STATE CAPITOL • 300 WEST MARKHAM • LITTLE ROCK, ARKANSAS 72201

March 5, 1976

Mr. Jerry W. Martin, P.E.
Engineering Services, Inc.
214 West Emma
Springdale, Arkansas 72764

Re: Lakeview Sewer System
Baxter County

Dear Mr. Martin:

This letter is written in response to your inquiry of March 3, 1976, regarding properties of architectural and historical significance in the area of the proposed Lakeview Sewer System.

The professional staff of the Arkansas Historic Preservation Program has reviewed the available material which pertains to the area in question. The staff of the Historic Preservation Program has reported that the proposed Lakeview Sewer System will not affect any property of architectural or historical significance.

Sincerely,

Anne Bartley

Anne Bartley
State Historic Preservation Officer

AB:cm

cc: Fred Kleihauer

A DIVISION OF THE DEPARTMENT OF ARKANSAS NATURAL & CULTURAL HERITAGE

February 16, 1978

RECEIVED
FEB 2[illegible] 1978
ENV SECTION

Mr. Jerry Martin
Engineering Services, Inc.
214 West Emma Avenue
Springdale, AR 72764

Dear Mr. Martin:

Enclosed is our report on the test excavations in the area of the proposed treatment facilities for the Town of Lakeview. We have determined that there are probably two separate sites in the valley, and that 3BA66a will be severely impacted by the construction of the treatment facility. We feel the site is eligible for nomination to the National Register and will be forwarding documentation for this determination within a few days. Mitigation of the adverse impact on that site will be necessary. The outfall and interceptor A lines do not appear to be placed in an area which will affect archeological resources, but it is possible that evidence of occupation is buried deeper than we were able to test. We request that when the construction begins for placement of these lines that we be notified, and that construction personnel be alerted to be on the outlook for evidence of prehistoric occupation, such as stone tools, bone, and pottery sherds.

We apologize for the delay in submitting this report. If we can be of further service, please let us know.

Sincerely,

Charles R. McGimsey III
Director

CRM/lcm
cc: State Planning and Development Clearinghouse
State Historic Preservation Officer
✓Environmental Protection Agency, Dallas
✓Sverdrup and Parcel
Town of Lakeview
Dan Wolfman

March 22, 1978

Mr. Charles R. McGimsey III
Director
Arkansas Archeological Survey
Coordinating Office
University of Arkansas Museum
Fayetteville, Arkansas 72701

RE: C-050 441-0 - Lakeview, Arkansas

Dear Mr. McGimsey:

I refer to the meeting in your office on March 20, 1978, between you, Jerry Martin of Engineering Services, and Steve Burkett and Paul Bergstrom of our EPA office. It is our understanding from this meeting that should the town of Lakeview wish to use the site as proposed in the Facility Plan for the above referenced project, then a small shift to the west of the treatment plant location should alleviate the need for a Stage 1 archaeological investigation of this project. If the eastern boundary of the treatment plant was to approximately coincide with test pit XU 3 as exhibited in your report, then sites 3BA66a and 3BA66b should not be adversely affected by the construction of the treatment plant. Please advise us if this is your understanding so that we may inform the Advisory Council on Historic Preservation.

Sincerely,

Clinton B. Spotts
Regional EIS Coordinator (6ASAF)

bcc: Fred Brunner, S&P

- Rspc. : fr [illegible] info

PRESERVING THE PAST FOR THE FUTURE

ARKANSAS ARCHEOLOGICAL SURVEY

Director · Charles R. McGimsey III
State Archeologist · Hester A. Davis

Coordinating Office
University of Arkansas Museum
Fayetteville, Arkansas 72701
Phone: 501-575-3556

RECEIVED
APR 27 1978
EPA
REGION VI
S.&A Div.

April 24, 1978

Mr. Clinton B. Spotts
EIS Coordinator 6ASAF
Environmental Protection Agency
First International Building
1201 Elm Street
Dallas, TX 75270

Dear Mr. Spotts:

This is in response to your letter of March 22 regarding our understanding about the location of the treatment plant for the town of Lakeview, Arkansas. A shift in the location would, in light of our current information, avoid 3BA66a, the prehistoric site we consider eligible for nomination to the National Register. It is likely that if the eastern boundary of the plant coincided with test pit XU 3, that there would be minimal or no effect on 3BA66b, however, we would like to have an opportunity to run auger tests in the area which would be affected by the new location since we did not determine the eastern boundary of 3BA66b. To facilitate decisions, the Survey will do this testing within the next six to eight days if possible, at no additional cost to the project, and notify you by phone of the results.

We have been contacted by Mr. Dean, the landowner, who suggested the possibility of the plant being located across Bruce Creek to the east. There is a previously recorded site in that location (mentioned in our report, 3BA45), which we deem also to be eligible for nomination to the National Register, and have indicated that to Mr. Dean. We still believe that the location west of 3BA66a would be the best for protection of the resources.

Sincerely,

Charles R. McGimsey

Charles R. McGimsey III
Director

CRM/lcm
cc: State Planning and Development Clearinghouse
State Historic Preservation Officer
Engineering Services, Inc.

MAY 2 - 1978

ENV

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